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# HOUSTON'S MUNICIPAL SOLID WASTE MANAGEMENT SYSTEM: A CASE STUDY

APPLIED MANAGEMENT SCIENCES, INC.

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ENVIRONMENTAL PROTECTION AGENCY

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This study examines solid waste collection and disposal in Houston, Texas. The background of the system, including location, geography, demography, climate, form of government, and the solid waste management agencies is described, and the characteristics of the system, including the services, equipment, and finances are discussed.

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# HOUSTON'S MUNICIPAL SOLID WASTE MANAGEMENT SYSTEM

## A Case Study

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## FOREWORD

Solid waste management systems are an integral part of the environment of nearly every citizen in the United States. Yet until recent years, these systems have not received the attention other visible residential services have enjoyed. This historical neglect has resulted in systems which may not be cost-effective, especially with respect to the rising cost trends encountered in solid waste management activities. These trends arise from two principal factors:

* Environmentally sound disposal methodology is being enforced or strongly encouraged; as a result, disposal sites and needed equipment are now expensive to procure and operate; and,

* The collection function is highly labor intensive. Thus, the costs of unskilled labor, which have been rising to meet socio-economic demands, have had enormous impacts on local agency budgets.

This rise in cost pressure has forced all levels of governmental organizations to consider more closely the management and costs of solid waste management activities.

Because efforts to upgrade solid waste management practices are in their infancy, there is still an obvious lack of data bases for evaluative and comparative analyses. This case study is one in a series of case studies of solid waste management systems which has been conducted under the sponsorship of the Office of Solid Waste Management Programs, U. S. Environmental Protection Agency. Kenneth Shuster and Cindy McLaren served as EPA project officers on the case study reported herein. The purpose of these case studies is to fill in this data gap with actual case histories of how cities are handling their solid waste problems.

Concerned agencies at all government levels, as well as private firms, will be able to access information of the following types:

* The management and operating characteristics of public sector solid waste management systems.

* The institutional forces which give rise to these characteristics.

* Those techniques that have been or are being applied to enhance the measures of productivity, aesthetics, level of service, and environmental control.

These agencies and firms can then use these comparisons to upgrade their systems according to the norms achieved in other cities of similar size, geographical location, and operational and institutional characteristics.

--ARSEN J. DARNAY
*Acting Deputy Assistant Administrator for Solid Waste Management*
Office of Solid Waste Management Programs

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# 1

## INTRODUCTION

The solid waste management system of Houston, Texas has been in a state of transition for nearly a decade. In 1965, the city initiated the recovery of a potentially marketable commodity, compost, from the solid waste normally incinerated and landfilled. This program was not successful and since that time, the greatest fraction of the disposal function has been contracted to the private sector. However, Houston has maintained a continuing interest in disposal technology as is demonstrated by the novel approaches taken toward incineration.

More recently, Houston has experienced a number of changes in the collection function and in the organizational relationships of the various departments of the city. Although the city is prohibited by state law from recognizing and negotiating with labor organizations, the solid waste collection workforce has been remarkably effective in transforming the system to its benefit. The first major shift was the reduction from a six to a five day work-week with no pay penalties. The "task" incentive program was continued at the same time. Furthermore, consideration is being given to a four day work-week. However, the division of responsibilities has yet to be formulated and it is likely to be a number of years before such a plan can be implemented.

Less than one year ago, the Department of Solid Waste Management was formally created from the Refuse Division of the Department of Public Works. This new organizational arrangement resulted from the requests of the workforce and apparently not from any bilateral city planning efforts. The primary result of this new organization is a happier workforce with no significant

sacrifice in either level or quality of service. Currently, there are plans to further compartmentalize the activities of the Department of Solid Waste Management. The equipment activities now performed by the Motor Repair Division of the Department of Public Works may soon be absorbed by the new department.

The case study of Houston, Texas was performed using a carefully structured interview technique. Initial contacts were made by both Office of Solid Waste Management Programs and Applied Management Sciences personnel and interviews were scheduled at the convenience of the city personnel. During these interviews, notes were taken and tape recordings were made after obtaining permission from the interviewees. Extensive efforts were taken to require a minimum of city personnel time and whenever possible, existing documentation was solicited to support the general discussions. Figure 1 presents the titles of the people interviewed in Houston, the dates of these interviews, and the types of information obtained.

This report consists of five chapters, including the introduction. Chapter 2 is a systems description abstract which synopsizes the characteristics of the city and the collection and disposal systems. Chapter 3 presents the findings of the case study effort and identifies potential problem areas. Chapter 4 is a description of the city in terms of those parameters which can affect solid waste management operations. Finally, Chapter 5 reports the characteristics of the solid waste system in considerable detail. All aspects of the system are discussed and appropriate tabular data are presented.

| TITLES | DATE | INFORMATION TYPE |
|---|---|---|
| Director, Department of Solid Waste Management | 12 Feb. | Historical data and current operating characteristics of the system |
| Manager, Department of Solid Waste Management | 12 Feb. | Details on the solid waste management system - principally collection |
| Supervisor of Collection, Department of Solid Waste Management | 12 Feb. | Same as above |
| Supervisor of Plants (Incinerator), Department of Solid Waste Management | 14 Feb. | Details on Incineration operations in the disposal function |
| Assistant Controller, City of Houston | 13 Feb. | Financial aspects of the Solid Waste Management system |
| Manager, Motor Repair Division, Department of Public Works | 14 Feb. | Equipment policies |
| Planner, Model Cities Department | 14 Feb. | Model cities involvement in Solid Waste Management activities |
| Director of Civic Affairs, Houston Chamber of Commerce | 13 Feb. | Chamber of Commerce - impacts on Solid Waste Management system |
| Business Manager and President, American Federation of State, County, and Municipal Employees | 14 Feb. | Effects of organized labor on Solid Waste Management activities |

FIGURE 1: DATA SOURCES AND INFORMATION TYPES

# 2

## SYSTEM DESCRIPTION ABSTRACT

City: Houston, Texas

| Contacts: | | |
|---|---|---|
| | Jack McDaniel, P.E. | - Director, Department of Solid Waste Management |
| | B.B. Howard | - Manager, Department of Solid Waste Management |
| | John W. Daut | - Supervisor of Collection, Department of Solid Waste Management |
| | James Odle | - Supervisor of Plants (Incinerator), Department of Solid Waste Management |
| | Roland Brunette | - Assistant Controller, City of Houston |
| | Harry Snead | - Manager, Motor Repair Division of the Department of Public Works |
| | Rick Gerlach | - Model City Department |
| | Charles T. Lansden | - Houston Chamber of Commerce |
| | Maynard White | - Business Manager and President, AFSCME Local 1550 of AFL/CIO |
| | Representative | - Houston-Galveston Council of Governments |

Dates of Visit: February 12 - February 15, 1973

Population Demography:

| Date | Total | White | Other |
|---|---|---|---|
| 1970 | 1,232,802 | 975,146 | 257,656 |
| 1960 | 938,219 | 720,547 | 217,672 |
| 1950 | 596,163 | --- | --- |

Area: [1] 451 square miles including Lake Houston
434 square miles (land area only)

Density: 2,841 people per square land mile

Mileage: [2] Roads: 4546 miles; 103 miles-freeway; 782 miles-primary; 3661 miles-secondary
Alleys: Minimal

Collection: Table 1

Miscellaneous: The mixed refuse collection operation is performed with a remarkable degree of effectiveness. More than 1,000 stops per crew are collected by men working under the task basis incentive system. All collection vehicles have innovative applications: Mixed refuse trucks have extra motors to drive the hydraulics and "grinder" type vehicles are being tested; bulky item trucks have a special side-loading hydraulic lifter and "Rotobooms" are on order. The introduction of other innovative concepts is likely to occur at a reasonably high rate.

Disposal: Table 2

Miscellaneous: Most of the disposal function is currently being performed by private sector companies in Houston. The municipal incinerator, rated at 800 TPD, has had a number of costly and disabling problems. The city is now testing mini-incinerators to be located at strategic "neighborhood" points.

---

1/ An annexation after the site visit raised the area of the city to 506.5 square miles.

2/ Now likely to be inaccurate data due to the annexation.

TABLE 1

COLLECTION ABSTRACT

| Collection Variables \ Collection Function | Mixed Refuse | Trash | Bulky Items | Ash | Animals |
|---|---|---|---|---|---|
| Number of Routes | 320 | 160 | 26 | 4 | 3 |
| Crew Size | 3 | 3 | 3 | 2 | 2 |
| Frequency of Service | 2/week | 1/week | on request - 2/month maximum | on request | on request |
| Point of Collection | curb | curb | curb | curb | curb |
| Method of Collection | Nothing special | Nothing special | Special side-loading Hydraulic Lift | Nothing special | Nothing special |
| Stops | 330,000 | -- | -- | -- | -- |
| Service Limitations | Residential - Unlimited number of containers ≤ 30 gal. and 100 lbs. each Commercial - 3 cans ≤ 30 gal. and 100 lbs. each | Bundles cannot exceed five feet in length and 18 inches in diameter | None | None | Animals ≤ 100 lbs. are collected free. Animals > 100 lbs. are collected for $15.00, but the fee is not charged at this time. |
| Incentive System | Task | Task | None | None | None |
| Fund Source | General Fund | General Fund | General Fund | General Fund | General Fund and Fees |
| Tonnage (annual) | 410,000 | 62,000 | 222,720 yards | NA | No. Small = 14,572 No. Large = 902 |
| Wage Scale (hourly) | Driver: $4.18 Helper: $3.61 | Same | Same | Same | Same |
| Unions | AFSCME 1550 and Texas Federation of Public Employees | Same | Same | Same | Same |
| Annual Cost | $3,920,154 | $980,039 | $794,169 | $76,037 | $67,589 |
| Comments | Very efficient at 1025 stops per truck per day | Collection is performed by Mixed Refuse Collectors on Wednesday | Very innovative equipment | None | None |

TABLE 2

DISPOSAL ABSTRACT

| Disposal Site / Disposal Data | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Type | Private Sector Landfill | Private Sector Landfill | Private Sector Res. Rec. Plant | Municipal Incinerator | Mini-Incinerator |
| Capacity | 2000 cubic yards per day (~ 500 tons/day) | 2000 cubic yards per day (~500 tons/day) | 850 tons per day | 800 tons per day | NA |
| Real Loading | 447 tons per day[1/] | 510 tons per day[1/] | 418 tons per day | 335 tons per day | NA |
| Expected Lifetime | 2 years | 2 years | NA | 25 years | NA |
| Operating Costs to City (not including Department service) | $219,592[2/] | $254,613[2/] | $554,460[2/] | $658,961 | NA |
| Start-up Costs | NA | NA | NA | More than $5,000,000 | Estimated $2,112,475 |
| Location | Holmes Road | Beaumont Highway | Lawndale Road | Holmes Road | Scattered[3/] |

1/ These figures do not include bulky item disposal. For 1972, approximately 222,720 cubic yards of such waste was disposed at these sites. This is approximately 450 cubic yards per day per site and is not too significant for either site.

2/ Calculated from true loading and fee schedules for a 250-day year. Does not include bulky items.

3/ Three sites have been selected: one in the northwest sector of the city, one in the northeast, and one in the southwest.

# 3

## FINDINGS AND CONCLUSIONS

The City of Houston and its solid waste management system have several unique and significant characteristics. The city is rapidly growing via annexation, the tax base is rising even faster and the tax rates are actually falling. Because of these factors and the lack of a zoning ordinance, land speculation is a common practice. The solid waste management system has had to adapt to these conditions and to other difficulties arising from both internal and external sources. Consequently, the most appropriate descriptor for the solid waste system is "flexible." Additionally, the system operates at a very high productivity rate with relatively low cost. The workforce is relatively happy, exceptionally stable, and has been able to secure a number of reasonable concessions from management. The city has disposal problems and has managed to solve them but only at a relatively high cost.

The growth patterns of size and wealth have two opposing effects. Growth in size and population requires that the solid waste management system expand to meet the rising service demand. The size of the increment and its location determine the extent of strain placed on the system. To date, the process of annexation has not created insurmountable difficulties for the system's ability to meet the demand for additional solid waste services. The growth in city resources has helped to alleviate difficulties in supplying both equipment and manpower when solid waste services were required to expand. Under these circumstances, it is apparent that the Department of Solid Waste Management in Houston is not faced with the common problem of growing service demands and shrinking resources.

Two aspects of the collection function of the solid waste system are remarkable. First, crew productivity for mixed refuse collection is exceptionally high, at about 1,000 stops per truck per day. Furthermore, collection service is twice per week at an annual cost of approximately $13.00 per dwelling unit. If the trash, bulky item, ash and animal collections are included, the total annual collection cost per dwelling unit is $19.47, a very low figure.

An equally surprising finding concerning the collection function is the apparent job satisfaction of the workforce. Turnover is exceptionally low and absenteeism is not regarded as a significant problem. It is likely that this high level of morale can be partially attributed to the workforce's success in changing the system to their benefit. The city management has responded to worker requests on a number of issues which include: departmental autonomy; a reduction from a six to a five day work-week with no pay penalties; and, the continuation of the task incentive system. Consequently, the origins of worker satisfaction are the abilities to communicate with management and to secure desirable working arrangements.

The disposal operations in Houston do not have the same history of success as does the collection function. Costs are relatively high because disposal responsibilities are principally contracted to the private sector for a substantial fee. The city does own a relatively new municipal incinerator, but it has been affected with a number of disabling problems which have resulted in limited use of the 800 TPD facility. The city has also contracted for ganged, batch-fed mini-incinerators for disposal purposes. These are allegedly pollution-free and appear to be of the pyrolytic or controlled air type. Slightly more than $2,000,000 has been appropriated for this project, now in its initial construction phase.

Apparently, the basic reason for the current disposal situation originates from the willingness of city management to attempt innovative approaches. With the single exception of a contract signed in 1968 for landfill, all approaches have some experimental aspects and have not met with high levels of success. However, there are continuing attempts to reconcile the problems in order

to maintain a continuing disposal capability. The new director of the Department of Solid Waste Management has stated that he is certainly in favor of resource recovery practices but not at his city's expense. Consequently, further innovation is unlikely without a thorough and competent cost-benefit analysis of proposals.

The Department of Solid Waste Management is not facing any major problems at this time. There are a number of relatively minor problems which are in various states of solution. First, the budgetary process in the city government often lags the start of the fiscal year by as many as six months. Since capital expenditures cannot be made during this interval considerable stress is put on those departments which must formulate equipment specifications and procure equipment. This aspect of city finance is not likely to change, so the director of the department is exploring ways to correct this situation. Typical thoughts include an amortization scheme which could result in a form of a revolving fund for equipment acquisition.

A second problem is the division of responsibilities for equipment purchases and maintenance. Currently, the Motor Repair Division of the Department of Public Works performs all vehicle maintenance and actively participates in replacement activities. This arrangement is not satisfactory to solid waste personnel at all levels and steps may be taken to shift part of vehicle maintenance responsibilities from the Motor Repair Division to the Department of Solid Waste Management. The recent public approval of a large bond issue which included $2,000,000 for a truck park and maintenance shop is a significant step toward this goal.

A third potential problem is the lack of a long range disposal plan for Houston's solid waste. The primary effect of disposal problems will be due to an increase in disposal costs and probably not an inability to secure suitable sites. The private sector can always be used and, additionally, the city can annex county lands for disposal purposes. Currently, a number of public and quasi-public agencies are examining regional disposal requirements and it is likely that a regional plan will be implemented in the near future. The

mechanism appears to have been set up for such an approach by virtue of the Texas Solid Waste Disposal Act.

Solid waste management operations in Houston are successful because the issues have been placed in the proper perspective. Management and manpower in the system understand and respect the needs and opinions of each other and concessions are made on a rational basis. Disposal has been treated as an important function and expediency has determined the methodology for this operation. The Department of Solid Waste Management is striving to maintain as many of the current operating characteristics as possible while still being openminded to further improvements. While some difficulties are now apparent, it is unlikely that insurmountable major problem areas will develop.

# 4

## BACKGROUND OF THE SYSTEM

Incorporated in 1836, the City of Houston is today the most populous city in the State of Texas. The city is located in the southeastern portion of the state, approximately 50 miles from the Gulf of Mexico. The Houston Standard Metropolitan Statistical Area encompasses Harris County, of which Houston is the county seat, and Brazoria, Fort Bend, Liberty, and Montgomery Counties. The total population for this five-county SMSA was greater than two million people in the 1970 Census. Despite the relative distance of Houston from the Gulf of Mexico, the Port of Houston is the third largest seaport in the United States. The 58-mile Houston Ship Channel, which links Houston with the Gulf of Mexico, has made Houston the busiest seaport in the Southwest.

The local economy is characterized by a wide variety of industries. Houston is first in the nation in petroleum refining and related industries, fourth in the production of chemical and allied products, and first in the manufacturing and distribution of petroleum equipment. Recently, other high technology industries such as electronic equipment, computer, and instrument manufacturers have established factories in the Houston area. The opening of the National Aeronautical and Space Administration's Manned Spacecraft Center only 22 miles from Houston's central business district has also been a significant addition to Houston's local economy.

The population growth rate in Houston was virtually twice that of the rest of the state in the interval between 1960 and 1970. The population within the city

limits increased by 294,597 persons during this ten-year period, and represents a ten-year growth rate of 31.4 percent. The growth rate for the state during this same period was only 16.9 percent. The primary reason for this phenomenon is that the land area of the city has grown from 321 to 434 square miles by the process of annexation. In fact, the actual population density dropped from 2923 to 2841 people per square mile during this interval.

4.1: Location, Geography, Demography, and Climate

The incorporated land area of Houston is 450.6 square miles, including Lake Houston and the Houston Shipping Canal.[1/] This makes Houston the nation's third largest city in terms of area and the sixth largest city in terms of population. It is located in the upper Gulf Coast prairies at an altitude averaging 41 feet above sea level.

The large number and wide variety of jobs available in the area make Houston a desirable place to live and work. The unemployment rate in the area has averaged only 2.8 percent over the past ten years, with rates substantially below two percent between 1966 and 1969.

The percentage of the black population living within Houston has remained virtually constant over the past ten years. The black population represented 23.2 percent of the total population in 1960 and has increased only slightly to 25.7 percent in 1970. This fraction for the Houston SMSA represented 19.3 percent of the total population. In addition to this substantial minority population, there are a considerable number of Mexican-Americans living in the area, accounting for 10.7 percent of the total population in the SMSA.

The climate of Houston is mild. Winds off of the Gulf of Mexico tend to produce warm winters and relatively cool summer nights. The average monthly temperature ranges from 55.7° Fahrenheit in February to 83.9° Fahrenheit in July. Total annual precipitation in the area averages approximately 38 inches and dry periods are rare occurrences. Snowfall is an infrequent visitor to the city and usually disrupts transportation when it occurs.

---

1/ An annexation after the site visit raised the area of the city to 506.5 square miles.

## 4.2: Form of Government and Organization

### 4.2.1: Form of Government

The elected leadership of the City of Houston consists of the Mayor, eight City Councilmen, and the City Controller. Three of the City Council members are designated as "at-large" members and represent the entire city. All officials are elected for two-year terms and elections are held during odd-numbered years.

The Mayor is the chief executive and administrative officer of the city. He appoints all department heads and sees that all laws and ordinances are enforced. Under this particular form of the Mayor-Council type of municipal administration, the Mayor also serves as the Chairman of the City Council. He holds most of the power of any City Councilman, including the power to vote on all Council matters, but he does not have the power of veto. This combination of administrative and legislative authority makes the Mayor of Houston a powerful and dominant political figure.

The City Council serves as the legislative body of the city. The members confirm all department heads appointed by the Mayor and also approve or change the annual city budget submitted by the Mayor.

The City Controller is the supervisor of the city's fiscal affairs. He administers the actual disbursement of funds and develops the financial statements and records requested by the other departments and agencies within the city government.

### 4.2.2: Organization

The municipal organization chart of Houston is shown in Figure 2. The Department of Solid Waste Management is responsible for both the collection and disposal of solid waste. Prior to July 1, 1972, these operations were administered by the Refuse Division of the Department of Public Works. The new, independent Department of Solid Waste Management was created in response to requests made by the Refuse Division personnel.

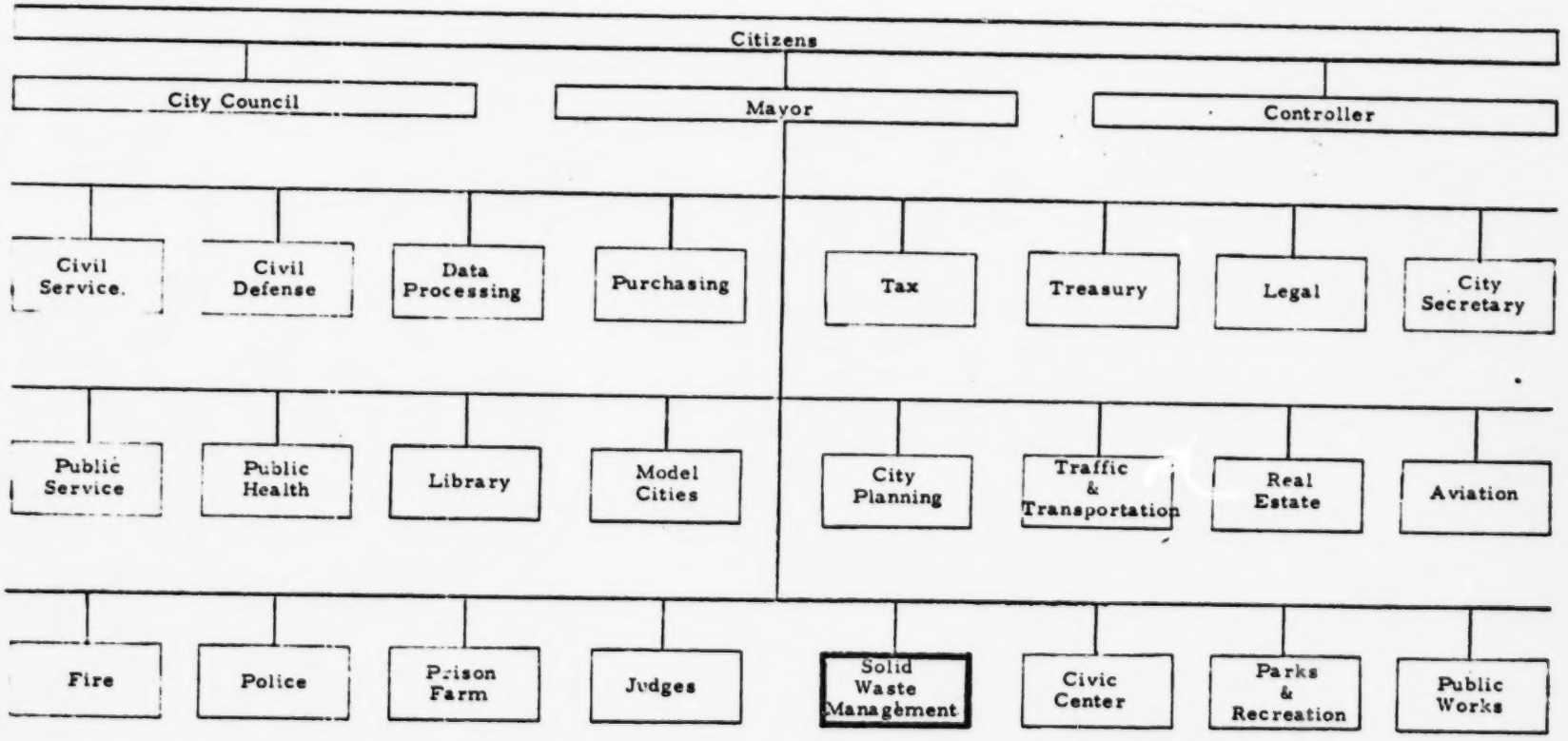


FIGURE 2: ORGANIZATION CHART OF THE CITY OF HOUSTON'S MUNICIPAL GOVERNMENT

The organizational form of the Department of Solid Waste Management is presented in Figure 3. In addition to the normal two branches of collection and disposal, there is a branch designated for disposal contracts. This novel division originated as a result of Houston's tendency to contract a significant fraction of the disposal operation to the private sector.

4.3: Solid Waste Management System History

Many of Houston's recent policy changes in solid waste management practices have originated from pressures put on the city by the solid waste system personnel. The remaining changes appear to have been initiated by local interest groups desiring to upgrade the aesthetic appearance of the city. All of these shifts have as their origins the rising awareness of solid waste as an important environmental issue.

In 1965, the Refuse Division of the Department of Public Works, upon request, expanded its level of service to include bulky item collection for four consecutive Thursdays during April of each year. Five years later, the Mayor placed this service on a scheduled basis and added the Wednesday "light trash" pick-up. At this time, the labor force went from a six to a five day week and the fleet necessary for bulky item collection was assembled. This transition was worker precipitated and resulted in the equivalent of the prior six days pay for five days work; the continued task incentive system was its basis. The scheduled bulky item collection policy was discontinued in the summer of 1972 because of the residents' difficulty in remembering the collection schedule.

On August 10, 1971, an enabling ordinance (Appendix A) was passed which formally separated solid waste management activities from the Department of Public Works and created a parallel structure, the Department of Solid Waste Management. This was reported to be the result of a long-standing desire of the workforce (including management) to become a relatively autonomous group. By early spring of 1972, the separation had still not been achieved, so the workforce petitioned the Mayor with a number of requests,

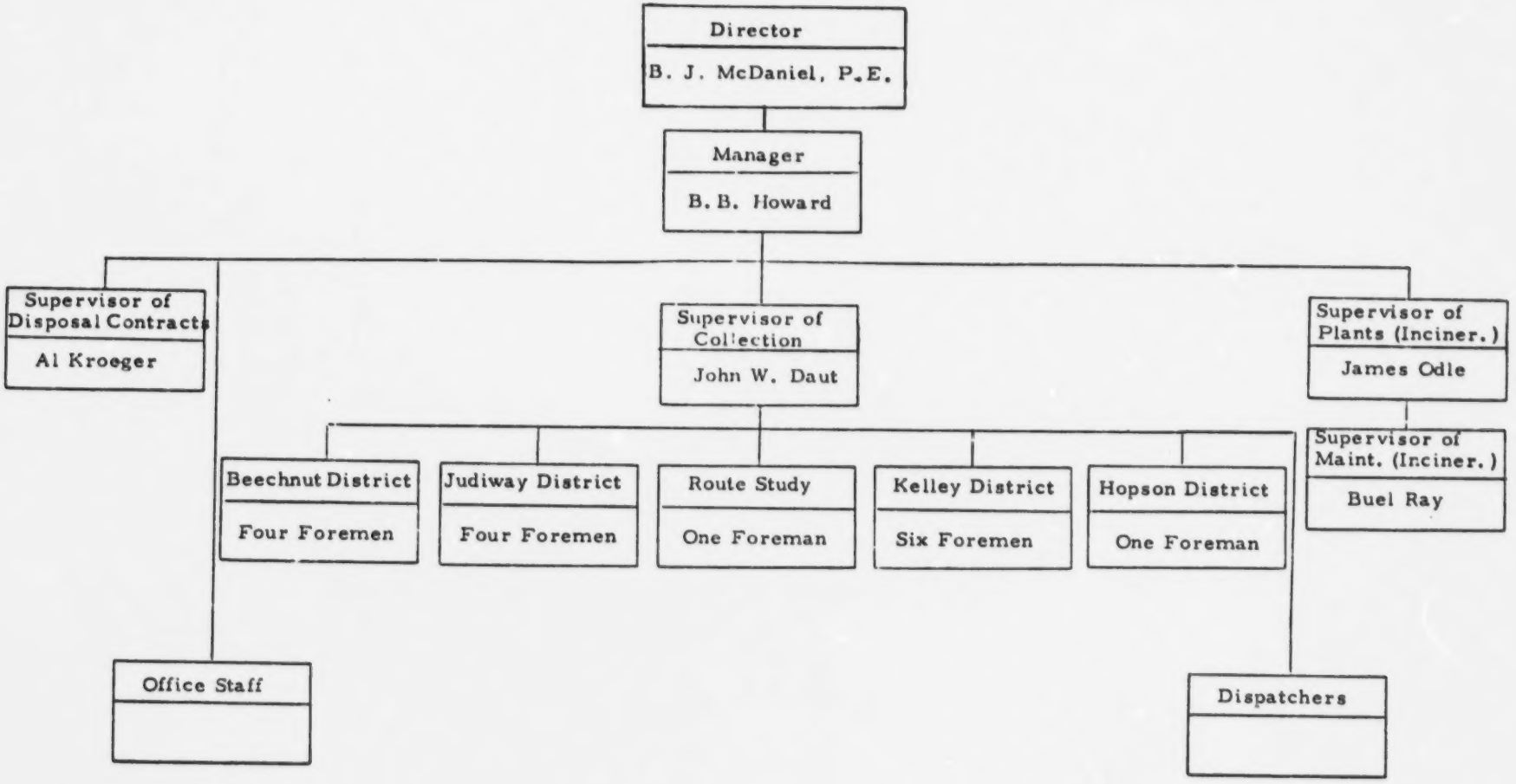


FIGURE 3: ORGANIZATION OF THE DEPARTMENT OF SOLID WASTE MANAGEMENT

including this issue (Appendix B). The Mayor responded on April 20, 1972 (Appendix B, also) indicating that a director for the new department was to be appointed almost immediately. This was done and the Department of Solid Waste Management became operationally separate on July 1, 1972.

During the interval from 1965 to the present, there were a number of events impacting the disposal operation in the city. These are discussed in detail in the next chapter but, in essence, the private sector became a very important part of the disposal methodology. This condition still exists and, in view of current policy, is likely to continue for some time. Consequently, disposal is a significant direct cost of solid waste management in Houston.

### 4.4: Agencies Impacting the Solid Waste Management System

There are a number of agencies at the state, county and local levels which have affected or currently impact the solid waste management system in Houston. The impacts from these agencies have not been severe because the city is quite responsive to legitimate requests and, in general, follows reasonable solid waste management practices.

#### 4.4.1: State Level Agencies

At the present time, there are three state agencies that can and do affect solid waste management practices in the City of Houston; the Department of Public Health, the Water Quality Board, and the Air Control Board.

##### Department of Public Health

The Department of Public Health administers the Texas State Solid Waste Disposal Act, a recent piece of legislation principally directed toward the interaction of county and municipal governments. This act resulted from the attempts of several state municipalities to secure landfill sites in surrounding counties where popular opinion was not receptive. This disposal act allows both county and municipal governments to control these activities by permit systems.

However, the act does encourage county governments to take the initiative in local disposal problems as illustrated by the following quotation:

> "The Texas State Department of Public Health encourages the county governments to exercise the authority provided in . . . (the Act) regarding the management of solid waste."

In essence, this means that the provisions (of the act) allow county governments to require and issue licenses authorizing and governing the operation and maintenance of sites used for the disposal of solid waste. Similarly, the municipalities have the same privilege, but because of the small probability of county waste being transported to the cities, the impact of the act is somewhat one-sided.

This condition should not suggest that Houston faces the "iron belt" constraint with respect to the surrounding Harris County. Because the city has the option of annexation, the problem of securing suitable landfill sites may well be academic. At this time, Houston does not have any plans for county disposal so the power of annexation for this reason has yet to be tested. However, if the experiences of site procurement within the city limits are any indication, the residents of potential county disposal sites may successfully block any efforts of this sort. Section 5.5 of the next chapter discusses this problem.

Water Quality Board

The Water Quality Board is charged with the responsibility of maintaining suitable levels of water quality in the State of Texas. Consequently, most emphasis has been directed toward sewage disposal facilities in the municipalities and counties of the state. The board, however, is also responsible for water quality problems arising from the disposal of industrial solid waste. Since Houston does not collect such wastes, the city is not directly affected by this function.

Houston does own an incinerator with a high energy water scrubber and the Water Quality Board is responsible for the issuance of a permit for the effluent discharge. Because of a number of problems with this facility, sufficient effluent quality data has not been obtained and the city has been issued an interim permit that will be reviewed when the incinerator is restored to operating condition. Houston management is confident of their water treatment processes and does not expect any difficulty in obtaining final approval.

Air Control Board

The Air Control Board must approve the construction and operation of all incinerators and other thermal processors and can close down facilities if they fail to meet emissions tests. The Houston facility has met these standards and is therefore approved under air quality laws. More strict legislation may, however, require that additional air pollution control equipment be installed in the future. Because of the design of this facility, such corrective measures may be extremely difficult.

The division of responsibilities among these three state agencies may not exist in the very near future. During the site visit, there was a bill before the State Legislature to form a "commission" on solid waste disposal that would absorb the responsibilities of the three current agencies in the solid waste management area. While this legislation was popular with solid waste management personnel and, would probably have resulted in more streamlined and less costly regulation and enforcement, it did not pass. However, a substitute bill (H.B. 1502, Environmental Study) was passed to undertake a comprehensive study of "all regulations, functions, etc., of state agencies responsible for environmental protection, and to recommend ways and means of improving the performance of such agencies."

4.4.2: County Level Agencies

There appear to be no county level agencies which have had any significant impact on solid waste management activities in Houston. There is a local Council of Governments (COG), the Houston-Galveston Area Council, and an organization named the Gulf Coast Waste Disposal Authority. These agencies represent groups which have studied the waste disposal problem, but not at great depth.

The COG published Part I of a Solid Waste Management Plan late in 1969. This document principally addressed solid waste problems in non-metropolitan areas of the region but did include data on the City of Houston. The document provided background information on the solid waste problem, present resources, recent developments, and legal considerations. It also included a comprehen-

sive series of county descriptions in terms of disposal sites and solid waste disposal requirement projections to the year 1990. The conclusion of this plan for Houston was:

> "Area 22, 23, 24, 25: Areas 22, 23, 24 and 25 constitute a large portion of metropolitan Houston. Nearly 2,000 acres of landfill are estimated to be required prior to 1990 if used as the exclusive method of waste disposal. Even though such operations are not contemplated, additional sites will probably be needed here. Large facilities should probably be considered (up to 500 acres per site), employing specialized earth-moving equipment as well as basic landfill equipment. Use of these sites for smokeless incineration, shredding, compressing, and extruding operations may soon be feasible. These and other areas of Harris County will be the subject of more detailed study in the second portion of this report."

Part 2 of the solid waste management plan has not yet been published.

The Gulf Coast Waste Disposal Authority is a relatively new organization, initially formed to provide advanced liquid waste treatment facilities for industrial waste generators. At this time, the Authority is constructing a number of these plants and is marketing its service in the area. Municipal wastes are being regarded as potential inputs, but only sewage sludge has been seriously considered. However, Authority personnel have discussed solid waste disposal with Houston management and it is likely that further talks will be held. The results of these discussions cannot be forecast.

4.4.3: Local Level Agencies

There are a number of local level agencies, both internal and external to the Houston government, which affect solid waste management activities in the city. For the most part, these agencies have not given rise to any problems that could not be easily handled by management personnel. However, the low-key pressures have resulted in policy changes and other compensatory measures.

However, there is one local condition in Houston that does not arise from a definite group and is historical in nature. The city does not have any zoning ordinance and, consequently, it is very difficult to generate meaningfull land-

use plans. This condition has two powerful effects on the Department of Solid Waste Management. First, it is very difficult to forecast the collection requirements and, hence, planning is more a matter of response than of planned change. Second, land speculation tends to drive up site costs and can affect landfill site procurement. The long-term effects of either of these factors cannot be ascertained.

Organized Labor - External

The union which has currently organized a substantial portion of the city's employees is the American Federation of State, County, and Municipal Employees. The union claims to represent approximately 3,000, or fifty percent of the city employees. For the Department of Solid Waste Management, union membership rolls are approximately 500, or seventy to seventy-five percent of the department's personnel. However, the Department of Solid Waste Management states that the A.F.S.C.M.E. represents 337 employees and the Texas Federation of Public Employees represents 133 employees.

There is a state statute which prohibits the city from engaging in collective bargaining. It is also against state law for public employees to strike. As a result, the union has neither a contract nor memo of understanding with the city. The grievance procedure is an informal "take it up the line" process in which union stewards attempt to obtain redress by proceeding from crew chief to supervisor to the superintendent, and higher if necessary.

The union representative noted that the sanitation employees desired to have the solid waste management system set up as a department separate from Public Works. He also noted that many members have second jobs to supplement their city paychecks. The union views as favorable the department's desire to operate its own maintenance system. It is felt that a lack of communication between the Motor Repair Division and the sanitation personnel may be causing maintenance difficulties.

It is interesting to note that the sanitation personnel are not civil service employees, and thus there is no appeals process to a Civil Service Commission. This is not a point of contention on the part of the union or management

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for two reasons. The union does not desire to subject refuse collection job applicants or promotion candidates to civil service examinations because of a literacy problem. Additionally, management feels that the civil service hiring process would impede rapid personnel acquisition requirements.

Although there are no "official" effects from union activities in the City of Houston, it is apparent that the organization of employees that comprise the union is relatively powerful. This condition is amply demonstrated by the relative success of the employees when dealing with the city management.

Houston Chamber of Commerce - External

The Chamber of Commerce has had a continuing interest in the appearance of the city and has actively taken part in a number of clean-up campaigns. The most important of these was the "Operation Sparkle" in 1965 which appears to have contributed significantly to the form of the current system.

Prior to this program, residents were required to provide for their own bulky item and light trash removal. Consequently, both classes of waste could be found in the streets of the city and there was a proliferation of dumps in the outskirts. The situation finally reached the proportion where it drew the attention of the Chamber of Commerce as well as other local interest groups. Operation Sparkle was the result.

Operation Sparkle initiated the bulky item pick-up, a procedure in which for four consecutive Spring Thursdays about 100 trucks and 200 crewmen were diverted from the Street and Bridge Department for this special collection. Citizens were required to call the city before the pick-up day, describe the nature and quantity of waste to be placed at the curb, and give their address. Calls for this collection rose from about 3000 in the first year to more than 25,000 in the fifth. At this point, the Mayor decided to purchase the required equipment and hire the manpower for continuous scheduled bulky collection. In 1970, this service was initiated. The history of the collection functions since 1970 was described earlier in this chapter.

The Chamber of Commerce also maintains an interest in resource recovery programs with particular emphasis on "front-end" systems. Although it was acknowledged that the composting idea was not sound because of the lack of market for the reclaimed material, it is still felt that resource recovery is viable if more waste fractions are separated and sold. This interest may be due, in part, to the recovery programs which have been tried in the city. Alternatively, the programs may be due to the interest of the Chamber of Commerce. The exact dependence could not be determined.

Current interests of the Chamber of Commerce include bulky item collection and resource recovery concepts. Additionally, it is felt that greater efforts should be expended to increase the number of street-side receptacles in high litter areas of the city. It has been observed that the litter problem is rising and that it can be controlled by an increase in the number of and more frequent collection from these convenient disposal containers.

Model Cities - External

The Model Cities Agency in Houston affects the activities of the Department of Solid Waste Management in several ways but the impact is not extensive. As in many cities, the Emergency Employment Act (EEA) provides for the employment of model cities area residents. For Houston, Federal funds support forty-five men of which fifteen are drivers and the balance are crewmen. The fifteen crews which are comprised of these men do not exclusively collect the model cities area, a deviation from the policy found in a number of other cities. These men have arbitrary scheduled assignments, no different from the balance of the workforce.

Another effect of Model Cities activities in Houston is the occasional implementation of local clean-up campaigns. It was reported that this policy puts considerable strain on the regular collection system because additional crews must be sent into the area to remove the assembled waste. It is felt by the system management that residents in model cities should use the bulky item collection service on a continuous basis rather than wait for special clean-up days. If this were to be done, then the system could easily perform removal activities on a day-to-day basis.

The Model Cities Agency was instrumental in the establishment of small scale collection and clean-up operation being administered by the city's Department of Health. This activity is separate and apart from those of the Department of Solid Waste Management and is discussed in more detail in Section 5.4 of the next chapter.

Sponsorships - External

A Sponsorship, a rather unique arrangement, consists of an aggregation of citizens in a local area who prefer to have a higher level of service (at a higher cost) than is provided by the city. Consequently, formal or informal representatives of these residents contract the collection function to private sector firms and are remitted approximately $1.40 per month per dwelling unit for services paid for (by taxes) but not received from the city. There are currently 64 of these entities representing 20,799 of the city's dwelling units.

The primary disadvantage of this arrangement is the impact on the solid waste management system when one or more of these sponsorships revert back to the city collection. Although this is not a frequent occurrence (only two reversions since July of 1972), it is difficult for the city to reroute to accommodate the situation. It was reported that if a number of sponsorships elect to return to city collection, it would be very difficult, if not impossible, to rapidly expand the city system to meet the new demand.

There is now a proposal before the City Council that would include townhouses as "disaggregated" sponsorships. Currently, many of these townhouse developments are collected by the private sector but there is no remuneration to the residents because of the lack of a representative structure. If the proposal is successful, the subsequent loss of revenue to the city for collection may be significant. Additionally, it is felt that commercial establishments and apartments owners would soon follow suit.

Private Sector Disposal Firms - External

Private sector firms have been indispensable to the City of Houston for the disposal function and it is anticipated that this will not change. The

earliest arrangement of record was a contract signed in 1965 for the operation of a composting plant which was to recycle a significant fraction of the city's waste. For a number of reasons, this effort was not successful. More recently, a second contract with another firm was signed for the disposal of solid waste with no recovery efforts. Disposal is discussed at length in the next chapter.

It is quite evident that private sector disposal is very expensive for the city. It was reported that such arrangements are a matter of convenience and expediency, since the city is not faced with the costs and problems associated with disposal site procurement, certification, and operation. It was also stated that if cities were to include all of the expenses and, in addition, allowed for taxes on profits, then private and public sector disposal operations would be economically comparable. This statement cannot be easily proven but may have considerable merit. However, cities are not taxed on general fund surpluses at the end of their fiscal years.

Controller's Office - Internal

The Controller's Office affects the Department of Solid Waste Management by controlling the procedures that are followed for the appropriation of capital and operating revenues. The City Budget is normally submitted in November of each year. From that point there ensues a series of negotiations between the City Council and the Controller's Office which last into late spring and, occasionally, into the summer. Finally, after appropriate compromises, the Budget is approved and the funds are released to the various departments of the city government.

During this time all departments, including the Department of Solid Waste Management, have to operate under a 'continuing resolution,' a minor problem. However, the major problem associated with this situation is the unavailability of funds for capital purchases until very late in the fiscal year. This factor, coupled with the procedures for equipment procurement, causes considerable stress in the department. Necessary equipment replacements are delayed, resulting in increased repair costs for the older vehicles in the fleet. Additionally, the executive workload rises because decisions must be

made and equipment specifications must be written in a relatively short amount of time. Capital expenditures tend to be cut off in November, leaving only a four-month period for capital acquisition efforts.

The Department of Solid Waste Management recognizes this problem but does not anticipate that Houston's financial policies will change. However, the department is taking steps to anticipate the annual equipment requirements and perform the necessary procurement on a continuing basis. As previously mentioned, the department is exploring the feasibility of setting up an amortization expense to support a revolving fund for equipment replacement.

Motor Repair Division, Department of Public Works - Internal

Equipment is a facet of the system shared by the Motor Repair Division and the Department of Solid Waste Management. At this time, both agencies share the responsibilities of writing equipment specifications and accepting newly delivered equipment. However, it was reported that in some past instances the specifications were written by the MRD without consultation with solid waste personnel. Additionally, the Motor Repair Division is responsible for the normal and emergency maintenance of all vehicles in the city, including those of the Department.

There is now a low-key area of contention between the two agencies. The head of the Motor Repair Division feels that the employees of the Department of Solid Waste Management are being careless with the fleet equipment. Similarly, the employees feel that the Motor Repair Division is not maintaining the vehicles as well as could be expected.

In early 1973, a bond issue was passed which includes $2,000,000 for the construction of a new truck park which could include a major maintenance shop in the facility. Consequently, in time, all solid waste vehicles are likely to be maintained by Department of Solid Waste Management Personnel which is a factor that should reduce, if not eliminate, accusations concerning vehicle care.

# 5

## SOLID WASTE SYSTEM CHARACTERISTICS

Houston is a large metropolitan area and, consequently, shares many solid waste system characteristics found in similar cities. In Houston, the collection functions performed by the Department of Solid Waste Management include mixed refuse, trash, bulky articles, ashes, and dead animals. The first two classes are collected on a fixed periodic basis whereas the remainder are collected upon request. The department is not involved in street cleaning. Litter basket collection activities are confined to the downtown area. The Department of Parks and Recreation collects refuse from litter baskets outside the downtown area. Street cleaning is the responsibility of the Department of Public Works.

Disposal activities are currently managed by the department but are being performed primarily by the private sector. However, the city does own a relatively new incinerator, which has been plagued by a number of problems and is not expected to begin full operation until the summer of 1973. At that time, it will absorb between 45 to 55 percent of the city's disposal burden. This matter is discussed in more detail in Section 5.5 of this chapter.

### 5.1: Collection Services of the Department of Solid Waste Management

The Department of Solid Waste Management is responsible for the periodic collection of the normal wastes generated by most of Houston's residents. Additional services include ash, bulky items, and dead animal pickup which are provided upon request. Appendix C presents the ordinance which prescribes solid waste responsibilities of both the collectors and the customers.

## 5.1.1: Mixed Refuse Collection

### Duties and Level of Service

Mixed refuse is collected from most residential units twice each week on either the Monday-Thursday or Tuesday-Friday schedule. Wednesday is set aside for trash collection. Small commercial establishments are also serviced, providing that the quantity of waste does not exceed the contents of three solid waste containers with a maximum capacity of 30 gallons each. Pathological and other hazardous wastes will not be collected and are the responsibility of the generator.

Residential customers receive unlimited curbside service for collection from suitable containers, none to exceed 100 pounds in weight or 30 gallons in volume. Disposable containers such as plastic or paper bags will be collected providing they meet standards set by the department. The fraction of customers who store their waste in such a manner was estimated at about 20 percent, but the city does not actively promote this practice and keeps no records of the number of customers using bags.

There are a number of sets of residential units that do not take collection service by the city. These are the "sponsorships" and consist of members of local community organizations that internally elect to receive a higher level of service, such as carry-out. Under this arrangement, the city will still collect anything left at the curb and will remit to these organizations a payment based on the calculated collection costs that are not incurred when the city does not collect. These revenues are then used by the sponsorship to augment the fee paid to the private sector agency that collects the area. As of January, 1973, there were 63 sponsorships representing 20,328 individual dwelling units, each of which received a monthly remittance of $1.38 per unit. 1/

### Manpower and Equipment Allocation

There are currently 160 crews, each consisting of a driver and two helpers, responsible for the collection of mixed refuse from 320 routes.

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1/ There are now 64 sponsorships representing 20,799 dwelling units.

Management personnel estimated that approximately 300,000 dwelling units are served every two days. This figure compares reasonably well with 1970 census data which indicates that there are 308,400 dwelling units (stops) contained in buildings with four or less units. Using the estimate provided by the city, the average crew collects about 940 residential stops per day, a remarkable achievement. Commercial pickups account for an additional 15,000 stops per day, resulting in an ultimate crew utilization of 1,030 stops per day.

Aside from the specification of curbside collection and the task incentive system, no other policies are used to enhance crew efficiency. Crews normally complete their routes in six to six and one-half hours. No special procedures are practiced at the stops on these routes. Each laborer collects one side of the street and the driver does not assist. All physical variables within the system are typical of large collection systems. For example, the average route length is 10 miles, the average distance from the route to disposal sites is also 10 miles, and trucks average 2.2 trips to these sites each day.

The vehicles used by collection crews are almost all twenty-yard rear-loading packers with a variety of bodies and chassis. A large fraction of these are equipped with auxiliary water-cooled motors to drive the hydraulics independently of the remainder of the power train. This application of technology has two significant effects of approximately equal importance. First, the prime mover of the truck is not loaded with hydraulic requirements, a factor likely to extend its life. Second, the packer mechanism can be operated while the truck is moving, a condition which certainly contributes to the collection efficiency but may give rise to job safety problems resulting from the pace of collection and worker carelessness.

There is another observation which deserves mention. The city has purchased "grinder" type collection vehicles which the manufacturer claims will improve collection efficiency by increasing packed waste density and decreasing the number of daily trips to the disposal site. The cabs and chassis of these vehicles have been troubled with mechanical difficulties and

no long-term comparative data has been developed. Management looks forward to further tests. Table 3 presents the manpower and equipment allocation for the collection operations.

Efficiency and Productivity

Table 4 presents the standard operating characteristics for the Department of Solid Waste Management during 1972. Attached to this table are a number of assumptions upon which the calculations are based. Crew productivity for mixed refuse is very high in Houston, with about 1,030 stops per truck per day being serviced. Correspondingly, truck and manpower efficiencies are also high at 12.3 tons per truck per day and 4.1 tons per direct man per day, respectively. If only the laborers are considered, then manpower efficiency is 6.2 tons per laborer per day. This is a very high value and can be partially attributed to curbside collection and the auxiliary hydraulic motor which drives the compacter mechanism.

The collection costs per dwelling unit are also remarkably low, especially in view of the fact that collection is twice per week. However, care must be observed when considering this factor because the total costs of the mixed refuse and trash collections have been separated even though the same crews perform both functions but on different days.

5.1.2: Trash Collection

Duties and Level of Service

The same crews that collect mixed refuse on the Monday-Thursday, Tuesday-Friday schedule perform the trash collection on Wednesdays. In this context, trash is defined as yard waste (grass, leaves, tree trimmings, etc.) and may be placed in 30-gallon containers or equivalent bags, or tied in bundles. The city, however, defines it differently, as seen in Appendix C. This conflict results from the relatively recent initiation of this service, which occurred about two years ago. At that time, the collection crews shifted from a six to a five-day week. Mixed refuse routes were lengthened and Wednesday was set aside exclusively for trash collection. It is on this basis that trash and mixed refuse are defined. Trash may be put in 30-gallon

TABLE 3: MANPOWER AND EQUIPMENT ALLOCATION

| Function / Personnel | Mixed Refuse | Bulky | Ash | Animals | Spares | Administrative | Total |
|---|---|---|---|---|---|---|---|
| Drivers | 160 | 26 | 4 | 3 | 3 | | 196 |
| Laborers | 320 | 52 | 4 | 3 | 89 | | 468 |
| District Foremen | | | | | | 15 | 15 |
| Route Study Foremen | | | | | | 1 | 1 |
| Management | | | | | | 5 | 5 |
| Clerical/Secretarial | | | | | | 6 | 6 |
| Totals | 480 | 78 | 8 | 6 | 92 | 27 | 691 |
| | | | | | | | |
| Equipment | | | | | | | |
| Rear Loaders (20 yd.) | 182 | | | | | | 182 |
| Rear Loaders (18 yd.) | 23 | | | | | | 23 |
| Front Loaders (30 yd.) | 2 | | | | | | 2 |
| Flatbed w/Side Lift | | 26 | | | | | 26 |
| Pickup (Special) | | | | 3 | | | |
| Pickup (Special) | | | 4 | | | | |
| "Grinder" type | 10 | | | | | | 10 |
| Totals * | 217 | 26 | 4 | 3 | 0 | -- | 250 |

Note: Two "Rotoboom" cranes and six 10-yard rear loaders are on order.

# TABLE 4: EFFICIENCY AND PRODUCTIVITY DATA FOR HOUSTON SOLID WASTE MANAGEMENT SYSTEM

| | Collection Function / Parameter | Mixed Refuse | Trash | Bulky Items | Ashes | Animals | |
|---|---|---|---|---|---|---|---|
| | | | | | | Small | Large |
| Community Description | Population Served | 1,080,000[1/] | | | | | |
| | No. of Resid. or Comm. Units | 330,000[1/] | | | | | |
| | Street Miles | 4,443 | | | | | |
| | Alley Miles | Minimal[2/] | | | | | |
| | Area (sq. mi.) | 451[2/] | | | | | |
| | Pop. density (peo/sq.mi.) | 2,395[2/] | | | | | |
| Waste Amounts | Annual Amounts Collected | 410,000 tons | 62,000 tons | 222,720 yards | NA | 14,572 | 902 |
| | Lbs./unit/wk | 50 | 7.2 | zero[5/] | - | - | - |
| | Lbs./person/day | 2 | .31 | zero[5/] | - | - | - |
| Collection System Description (inc. Level of Service) | Point of Collection | Curb or Alley | | | | NA | |
| | Freq. of Collection | 2/week | 1/week | On request | | | |
| | Type of Storage Container | 30 gal. container[6/] | None specified | | | | |
| | Avg. Dist. to Disp. Site | 10 miles | | NA | | | |
| | Avg. Miles Driven/truck/day | 60 miles[7/] | | NA | | | |
| | Avg. Hours worked/day | 6-6.5 | | 8 | | | |
| | Direct men | 480 | 480[8/] | 78 | NA | NA | |
| | Crews | 160 | 160 | 26 | NA | NA | |
| | Crew Size | 3 | 3 | 3 | NA | NA | |
| | Trucks | 160 | 160 | 26 | NA | NA | |
| Wages | Avg. wages and fringe for laborers | $3.61 Direct + $1.20 Fringe → $4.81 | | | | | |
| | Avg. wages and fringe for drivers | $4.18 Direct + $1.39 Fringe → $5.57 | | | | | |
| Collection Cost/Efficiency Figs. | Stops/Crew/Day | 1030 | NA | NA | NA | NA | |
| | Tons/Crew/Day | 12.3 | 7.6 | 32.9 yards | NA | NA | |
| | Coll. Cost/resid. unit/yr. | $13.07 | $3.27 | $2.65 | $.25 | $.23 | |
| | Coll. Cost/person/yr. | $ 3.63 | $ .91 | $ .74 | $.07 | $.06 | |
| | Coll. Cost/ton/yr. | $ 9.56 | $15.81 | $3.57 yard | NA | NA | |
| | Total Coll. Cost/yr. | $3,920,154[11/] | $960,039[11/] | $794,169 | $76,037 | $67,589 | |
| Disposal | Type & No. of Disp. Sites | 2 landfill sites, 1 transfer/resource recovery site | | | 1 incinerator | | |
| | Total Disp. Cost/yr. | $1,795,911 | | | | | |
| Total Cost | Total Cost/yr. | $7,941,214 | | | | | |
| Misc. Cost Ratios | Coll. Expense as % of tot. Exp. | 73.5 percent | | | | | |
| | Coll. labor expense as % of tot. Coll. | 87.1 percent | | | | | |
| | Coll. equip. expense as % of tot. Coll. | 12.9 percent | | | | | |
| | Proc. & Disp. expense as % of tot. exp. | 22.6 percent | | | | | |
| | Proc. & Disp. labor expense as % of tot. disp. | 36.7 percent | | | | | |

TABLE (Continued)

ASSUMPTIONS AND COMMENTS

1. Based on 3.6 persons per family as reported in the 1970 census and an estimate of 300,000 dwelling units collected. It is assumed that one family occupies one dwelling unit. There were 393,368 occupied dwelling units in 1970 and of these 79,850 were in buildings with greater than four dwelling units: These were discounted as the storage requirements are likely to eliminate these as stops. Commercial stops account for an additional 30,000 units.

2. Including Lake Houston and the connecting canal at the time of the site visit. City area is now 506.5 square miles.

3. This figure is the population density of the residents that receive service. The actual population density is 2,870 people per square mile.

4. Tonnages for mixed refuse and trash collections are the best estimates provided by the system management. The bulky item collection is reported in cubic yards and is an accurate number. However, this cannot be converted to tonnage because of the heterogeneity of components. Ash collection was not reported but it is picked up separately and may be included in the trash figures.

5. Bulky collection disaggregation is reported in yards rather than pounds and is too small to be specified for these entries.

6. Maximum of 30 gallons per container, either conventional or approved bag.

7. It was reported that disposal sites average 10 miles from routes and that collection vehicles average 2.2 trips per day. Route lengths were reported to average 10 miles long, and an additional 10 miles has been assigned for travel to and from routes from the truck lots.

8. Trash is regularly picked up on Wednesdays by the Mixed Refuse collection crews. Any waste placed at the curb will be collected from any residence. The number of collections on this day will normally be far smaller than the number of dwelling units.

9. Mixed Refuse efficiency calculation is based on 208 annual collection days and Trash collection is based on 52 annual collection days. Bulky waste is collected 260 days per year. All assignments do not include holidays. All efficiencies are therefore conservative.

10. The cost of the total collection function was determined after subtracting incinerator, disposal, and sponsorship costs from the estimated 1972 operating budget. Subsequent to this procedure, the respective fraction of each collection function was determined by ratio of personnel assignments with respect to all personnel: extra men and the administrative burden was allocated to each function proportionately.

11. Since trash is collected on one of five workdays by the same crews, the costs for mixed refuse and trash collection were calculated by multiplication of these crews' costs by 0.8 and 0.2, respectively.

12. This cost includes the payments to the private sector disposal firms and the salaries of the personnel at the incinerator. The latter were calculated using the ratio of the disposal to total personnel for FY 1973 and multiplying it with the 1972 personnel costs. This value does not include any capital and repair costs to the incinerator.

13. Includes remittance of $307,000 to sponsorships but does not include annual vehicle replacement costs of about $600,000.

14. Calculated as 100 percent minus the Automotive Maintenance and fuel costs.

15. Collection and Disposal percentages will not add to 100 percent as 3.9 percent was remitted to sponsorships.

16. This is a misleading figure as disposal is bifunctional in that both incineration with some labor costs and contracting to the private sector is done.

containers or is bundled and is only picked up on Wednesday, whereas mixed refuse must fit into a 30-gallon container and will not be picked up on Wednesday. Naturally, trash items cannot exceed a certain maximum size: In the ordinance, the maximum size of a tied brush bundle cannot exceed five feet long by 1.5 feet in diameter and must be no heavier than 75 pounds. Presumably, this is the maximum amount of material upon which a compactor mechanism can effectively operate and is a maximum load which workers can safely lift.

Manpower and Equipment Allocation

Trash collection crews and equipment are the same as those used to collect mixed refuse during the remainder of the week. These crews travel both of their normal routes on Wednesday and stop to collect only when waste has been placed at the curbside for collection. Consequently, not all stops actually receive a collection on Wednesday.

Efficiency and Productivity

Again referring to Table 4, productivity of trash collection activities is somewhat lower than for corresponding mixed refuse collection. This is not a surprising result, since the staff for both functions is identical and the trash quantities collected are considerably lower than for mixed refuse. Thus, trash collection productivity is material-limited rather than staff-limited if it is assumed that the time required to travel two routes on a trash collection day is equal to the time required to collect one route on a mixed refuse day.

5.1.3: Bulky Item Collection

Duties and Level of Service

Bulky items too large for trash collection trucks are collected by a separate set of crews and trucks. Such collections are now made on request, whereas there was once a fixed schedule of two collections per month. Under the old system, the bulky item collectors completely covered the city twice each month with specific routes being serviced each day. Residents who wished to have bulky items removed were expected to remember their collection schedule. This was not a successful approach as some citizens placed

their discards at the curb at any time and they remained there until the collection day arrived. This situation was clearly not acceptable and the city changed the service to a request basis, with a maximum number of services to remain at two per dwelling unit per month.

Manpower and Equipment Allocation

Table 3 presents the personnel and equipment strength allocated to bulky item collection. The normal crew is three men and all work during a pickup. The equipment used by these crews are specially adapted flatbed trucks with hydraulic lifting platforms mounted on the side just behind the passenger door. Unlike trucks with lift-gate devices mounted in the rear, the arrangement for the Houston equipment allows the truck to park immediately adjacent to the item to be loaded, minimizing lifting and carrying efforts.

Efficiency and Productivity

Table 4 indicates that bulky item collection is not as efficient as the mixed refuse collection when compared on a volume basis. The mixed refuse crews use 20-yard packer trucks and make an average of 2.2 trips to a disposal site each day. Consequently, the average daily mixed refuse collection is about 44 cubic yards and is greater than the volume collected by the bulky item crews. This smaller value for crew productivity probably results from both the unscheduled nature of bulky item collection and the longer length of time necessary to service a bulky item stop.

5.1.4: Ash and Dead Animal Collection

Duties and Level of Service

Like bulky item collections, ash and dead animals are collected on request. Ash is normally generated by buildings that employ incinerators for internal disposal and volume reduction processes. There is no reference to ash collection in the ordinance, but it can be assumed that the volume restriction is not applicable. The maximum weight of container and contents cannot exceed 100 pounds.

Both small and large dead animals are collected from locations not engaged in animal processing operations. Small animals are collected for free and there is a $15.00 fee for the collection of any carcass exceeding 100 pounds. However, this fee is not being collected at the present time.

Manpower and Equipment Allocation

Both ash and dead animal collection are small operations in comparison to the other collection activities. Ash is collected by eight men that operate four special pick-up trucks. This particular choice of equipment resulted from some unfortunate experiences when ash was inadvertently loaded into packer trucks containing combustible materials. The ash was live and the trucks were destroyed in the ensuing conflagrations.

The dead animal collections are performed by three, two-man crews operating three pick-up trucks. These crews perform small animal collection. Large animals such as cows, swine, etc., are quite massive and are picked up by a specially built truck.

Efficiency and Productivity

Because of the special nature of both ash and dead animal collections, measures of efficiency and productivity are not suitable measures of effectiveness. Furthermore, because of the very low volume of ash collection, annual data is not kept on collection tonnage. Similarly, animals are identified as discrete units rather than in terms of volume or mass.

Notwithstanding these conditions, truck and crew efficiencies will not be high because of the "request" nature of collection. It can be assumed that because of this practice, efficiencies and costs will be comparable with the bulky item collection operation. In any event, Table 4 indicates that ash and dead animal collection costs are very small burdens on the citizens of Houston.

## 5.2: Quality of Service

The Department of Solid Waste Management does not keep records of complaint data at this time, although it was reported that such records were

once kept. There is, however, a procedure practiced to answer complaints within two hours of receipt of a call. Complaints from residents are received by the dispatch office. Every hour, the route foremen call the same office and any complaints are then investigated. Legitimate problems are rectified by having either the route crew or one of the special trucks (ash collection) service the complaint. This is a very good rapid response capability which does not appear to be shared among many systems of Houston's size. This system could be improved with the incorporation of two-way radio communication between the dispatch office and the route foremen.

Another aspect of quality is the level of service offered with respect to how much of the total waste generated is actually collected. Until 1965, the only collections were mixed refuse, ash, and dead animals, with trash and bulky items left to the generator for disposal. During that year, the city initiated "Operation Sparkle" which added the collection of trash and bulky items for limited periods each year. It could be inferred from the application of this new policy that before 1965 the city was having an appearance problem and, consequently, service quality was not sufficiently high. An appearance problem still exists but is expected to improve.

There is one other quality parameter that should be mentioned. The Houston Chamber of Commerce apparently feels that there is an insufficient number of street containers in the city and that this condition is starting to contribute to a litter control problem. From all appearances noted during the site visit, street litter is not a conspicuous problem at this time. There is a litter problem related to parcels of privately owned land. The owners of such properties are not specifically required to keep such areas cleared of litter and other vagrant waste, but they are prohibited from creating dumps. There is apparently no mechanism to handle the gradual and casual accumulation of solid waste and some private lots show a deterioration in aesthetic appearance.

## 5.3: Labor Management Relations

The City of Houston, like all other Texas cities, is prohibited by state law from either recognizing or entering into formal negotiations with labor

organizations. The major fraction of the skilled and unskilled labor force is, however, represented by two unions: the American Federation of State, County, and Municipal Employees (AFL/CIO) and a small independent organization entitled the Texas Federation of Public Employees. The unions, of course, cannot bargain for their members; but they have performed and can operate as an effective locus for policy formulation.

As a case in point, in the early spring of 1972, a petition signed by 650 solid waste employees was sent to Mayor Welch for his attention. This petition, presented in Appendix B, enumerated a series of points centering around the general wish of the employees to become a department separate from and parallel to the Department of Public Works. Mayor Welch answered these points in a letter, also presented in Appendix B. As a consequence of this document, the Department of Solid Waste Management was created on July 1, of 1972, with the appointment of the full-time rector.

The employees have been effective in other issues relating to solid waste management activities. For example, about three years ago the collection activities were performed on a six-day schedule of fixed length. At that time, the employees of the Refuse Division of the Department of Public Works approached the Mayor and Council and successfully pleaded to have the workweek reduced to five days and to have no cut in worker pay. The city was able to meet these requests because the lower echelon workers in solid waste activities are not covered by a civil service system.

The absence of the protection of a civil service system does not appear to be felt by the employees of the Department of Solid Waste Management. In fact, the fringe benefits represent an additional 33 percent over and above the direct wage paid. Table 5 presents more detailed information on the extent of specific benefits. It is interesting to note that Workmen's Compensation is not a benefit and, consequently, the possibility of malingering is reduced. With the absence of civil service rules, there are no written grievance procedures in effect at this time. The system management feels that this situation needs to be rectified and will initiate such an effort during the next fiscal year.

TABLE 5

EMPLOYEE BENEFITS

| Benefit | Percentage Paid by Employer or Member |
|---|---|
| Medical/Surgical | 100% |
| Sick Leave with Pay[1/] | 15 days |
| Paid Holidays | 9 days |
| Paid Vacations or Leave[2/] | Employee pays 4% of salary to fund |
| Retirement or Pension Plan | City pays 8% of salary to fund |
| Group Life Insurance | 100% |
| Credit Union | -- |
| Personal Leave - Death in Family | Nominal |
| Military Leave | As required |
| Jury Duty | As required |

1/ Accumulation is unlimited for sick leave use. In case of termination, accumulation is at full time to 90 days and 25 percent of full time in excess of 90 days. Accumulated sick days are reimbursed only to employees leaving after two years.

2/ Accumulated to 60 days and is reimbursed to employee upon termination.

On the whole, the work force seems reasonably content and, in fact, turnover does not appear to be a major problem. Table 6 presents tenure data provided by management for all of the work force employed by the department at the time of the site visit. If the number of employees with tenure of less than a year represents the turnover rate, then the value in Houston for unskilled workers alone is 2.4 percent. This is extremely low: Even if the number of employees with tenure between one and two years were included, the modified turnover value is still only 19.2 percent, about half of the national average for blue collar workers.

TABLE 6

TENURE DATA

| Years | Managerial | Clerical | Foremen | Skilled | Unskilled |
|---|---|---|---|---|---|
| 0-1 | | 1 | | | 13 |
| 1-2 | 1 | 1 | 1 | 13 | 92 |
| 2-3 | | | | | 70 |
| 3-4 | | | | 3 | 60 |
| 4-5 | | | | 5 | 67 |
| 5-6 | | | 1 | 9 | 30 |
| 6-7 | | 1 | | 7 | 25 |
| 7-8 | | 1 | | 8 | 28 |
| 8-9 | | | 1 | 8 | 20 |
| 9-10 | 1 | | | 7 | 12 |
| 10-11 | | 1 | 1 | 3 | 9 |
| 11-12 | | | | 5 | 12 |
| 12-13 | | | 1 | 5 | 4 |
| 13-14 | | | 1 | 6 | 6 |
| 14-15 | | | | 13 | 11 |
| 15-16 | | | | 4 | 11 |
| 16-17 | 1 | | 2 | 17 | 16 |
| 17-18 | 1 | | | 10 | 6 |
| 18-19 | | | 1 | 17 | 10 |
| 19-20 | 1 | | 1 | 7 | 5 |
| 20- | 1 | | 8 | 70 | 41 |
| Total | 6 | 5 | 18 | 217 | 548 |

Absenteeism was said to be an occasional problem, especially on Mondays, but it is not regarded as a problem of significance. This may be due to the reasonably liberal benefit package which allows 15 days of paid sick leave and the task incentive system. Also, the lack of Workmen's Compensation benefit may contribute to reduce absenteeism.

Employee injuries remains one of the department's more serious problems. It is interesting that incidence rates were found to rise after the initiation of the task basis incentive system. In descending order of

frequency, the five most frequent injury types incurred are: strained back and shoulder muscles; sprains of the legs, ankles, and shoulders; lacerations; abrasions; and, contusions. Occasional permanent injuries do occur as a result of packer mechanisms. The work force apparently shares the opinion of management that injuries are a serious issue. This statement has as its support the ninth point in the worker petition (presented in Appendix B), which stresses the need for the city to find suitable alternative employment for people permanently injured on the job.

## 5.4 Inner City

There is a definite inner city area surrounding the business district of Houston. In these neighborhoods, solid waste problems are considered to be second to a host of others: For example, water and sewer lines are very old and, consequently, are in need of extensive repairs. Therefore, only nominal attention has been given to solid waste issues as other problems have had greater priority.

In response to a general litter problem in the inner city area, the Model Cities Agency appropriated funds for the purchase and operation of a small number of trucks for general clean-up purposes. Houston's Department of Health administers this operation under its Environmental Health Program. The crews have the assignment of the general cleaning of lots, ditches, right-of-ways, and other related conditions. Additionally, the Department of Health is "on-call" for a rapid response to blight conditions.

To place this operation in perspective, it should be noted that there are a large number of areas in the city, including portions of the inner city, that are not provided with storm sewers. Rather ditches are used to handle any emergency drainage situation. These ditches are used for disposal purposes by many inner city residents and are difficult to keep clear. Since the ordinance specifying solid waste storage and collection is reasonably restrictive, neither the Department of Solid Waste Management nor the Division of Bridges and Streets of the Department of Public Works will remove discarded items from these ditches.

The ordinance does require residents to properly store their wastes and prohibits illegal disposal. Property owners are held accountable for malfeasance, but there does not appear to be an effective surveillance and enforcement program in operation. It should be noted that absentee ownership of residents was said to be low; consequently, there is little difficulty identifying the responsible parties.

It was also stated that a significant problem in the inner city's area was lack of services which, presumably, includes solid waste collection. While this allegation is difficult to assess, it is noted that solid waste collectors have the option to bypass collection points if the waste is not stored or placed according to ordinance. It is occasionally found that residents of inner city areas are less than careful with their discards, which would invite skipped pick-ups.

## 5.5: Disposal Methods - Present and Planned

In recent years, the City of Houston has been quite innovative in its approaches to disposal needs. It is apparent that management is aware that disposal is not just a process than can be performed and dismissed. City planners are well aware of certain properties of solid waste as well as the costs and difficulties encountered in the disposal process. However, even with this relatively high degree of sophistication, the approaches to disposal have not been without problems.

The value of land in the Houston area has always been high because of the absence of zoning and the growth rate of the city. Consequently, historical disposal approaches have always been directed toward maximum volume reduction to achieve good ultimate disposal efficiency. Incineration was chosen many years ago as the preferred methodology, and recent history indicates that this philosophy is still being followed. In 1968, a modern municipal incinerator rated at 800 tons per day was constructed and, more recently, the city has contracted for the construction and operation of "mini-incinerators" strategically located at a number of points. Another disposal approach has been tested: In 1965, the city entered into contracts with three

firms to compost solid waste and recover other materials. None of the "compost" approaches have met the expectations of the city for a number of reasons. For example, of these three contracts, one plant was never built and another was built but operated only for a short time. Nearby residents complained and, as a result, the city was forced to stop refuse delivery to the facility. The company sued the city and was ultimately awarded a $2,000,000 judgement. Table 7 presents the disposal history of Houston for the last four fiscal years.

On the 24th of March in 1965, the City of Houston entered into a 20-year contract with the Metropolitan Waste Conversion Corporation for the disposal by composting of 300 $\pm$ 30 tons per day of solid waste. At that time, the disposal fee to the city was $3.53 per ton with a minimum of 1800 tons per week. The only responsibility of the contractor was to accept a maximum of 330 tons per day of mixed refuse and trash (only) and convert it to compost plus inorganic residue. The city was to: provide the site (to be rented by the contractor); provide five to ten tons of sewage sludge per day for the process; and, to accept the responsibility of the ultimate disposal of the residue. Unfortunately, the concept failed because the contractor was unable to find a market for the compost that was produced.

It happened that the contractor had acquired an inventory of approximately 6000 tons of compost and, consequently, received a number of complaints from nearby residents. The city of Houston acknowledged this difficulty and, on the first of December, 1971, signed a second agreement with the same company. In the preamble, the following statement was made: "WHEREAS, it has been found not to be feasible for such plant to be operated solely as a composting plant, to the exclusion of other desirable approaches to the problem of solid waste disposal; . . ." This new contract has a life of five years and contains a number of new provisions:

- A new guaranteed minimum delivery was set at 1500 tons per week with a maximum of 850 tons per day.
- The City of Houston recovers 10 percent of the revenues for any material recovered and subsequently sold with a minimum of $.175 per ton delivered by the city to the plant.

TABLE 7

DISPOSAL SITE USE AND HISTORY [1/]

| Site \ Fiscal Year | 1969 | 1970 | 1971 | 1972 |
|---|---|---|---|---|
| INCINERATION (Subtotal) | 13,332 | 45 | 26,939 | 17,060 |
| Holmes Road | 13,332 | 45 | 26,359 | 16,763 |
| Mini-Incinerator (Pilot Project) | --- | --- | 580 | 297 |
| CONTRACTED DISPOSAL (Subtotal) | 47,934 | 75,943 | 68,595 | 68,770 |
| Metro Lone Star Organics | 20,600 | 6,937 | --- | 20,911 |
| American Refuse Systems | | | | |
| Ella Site | 27,334 | 32,579 | 18,772 | --- |
| Kirkpatricks Site | --- | 13,736 | 9,743 | --- |
| Almeda Site | --- | 5,723 | --- | --- |
| Holmes Site (New) | --- | 16,968 | 23,748 | 22,356 |
| Beaumont Highway Site | --- | --- | 16,352 | 25,503 |
| CITY LANDFILL (Subtotal) | 32,633 | 31,931 | --- | --- |
| Holmes Site (Old) | 14,780 | 20,742 | --- | --- |
| Reed Site | 17,853 | 11,189 | --- | --- |
| GRAND TOTAL | 93,899 | 107,919 | 95,554 | 85,830 |

1/ All numbers in this table are given in 20 cubic yard truck loads. The entries for 1971 and 1972 are for mixed refuse and trash only and do not include bulky item disposal of 11,483 and 11,136 loads for these years. This waste was disposed in the Holmes Road Site (new) and Beaumont Highway Site in approximate proportion to the mixed refuse and trash loads accepted at those landfills. Bulky item disposal data were not maintained separately in 1969 and 1970 and the figures presented for these years include this disposed waste.

- The city is to receive credits for the weight difference between plant input and plant output of unusable materials. The contractor is responsible for the transportation of these materials to the disposal site, and weight reduction means that these costs are lower. The bill to the city reflects this savings.
- A new fee schedule was established, as follows:

| Average Number of Tons Per Day | Base Fee Per Ton |
|---|---|
| 1st 300 tons | $5.60 |
| Next 150 tons | 5.40 |
| Next 150 tons | 4.95 |
| Next 150 tons | 4.90 |
| All additional tonnage | 4.75 |

- The contractor must provide and operate the ultimate disposal site.
- The compost "inventory" must be removed within one year and, thereafter, all newly composted material will be stored in an area not to exceed 2000 square feet.
- Not less than 200 tons per month will be processed by composting. 1/
- All processes must be sanitary.

From these provisions, it is apparent that both the city and the company managed to negotiate some favorable concessions. Primarily, the city has resolved a significant fraction of its disposal problems in that the contractor assumes total responsibility of the waste upon delivery. On the other hand, the contractor is no longer constrained to recover all of the solid waste. In fact, the 200 tons per month that is required to be composted is a very small fraction of the waste throughput. What exists, in fact, is a relatively competitive transfer station in which the operator manually and mechanically processes the waste for valuable scrap and disposes of the residue in its own landfill.

There is a second private sector contractor participating in disposal activities for the City of Houston. On the 11th of September, 1968, American Refuse Systems, Inc., entered into a six-month renewable contract with the city to dispose, by landfill, a minimum of 300 loads per week (50 per day) at

1/ At this time, however, no compost is being produced because a fire destroyed the required equipment.

$10.00 per load. The company would accept anything but hazardous materials. The contract was amended on July 14, 1971, to redefine the fee basis from "load" units to "yard" units. The new fee schedule established a cost of $.50 per yard for disposal of city waste which, because the city uses almost all 20-yard packers, did not significantly alter the initial arrangement. A possible difference is that the bulky waste and ash truck collections disposal costs are now lower since a load for these vehicles is significantly less than 20 yards. Also, the "grinder" type vehicles currently being tested by the city may lead to more favorable disposal costs. This factor, of course, depends on the characterization of landfill as either a "volume" or "mass" disposal operation.

As mentioned earlier in this section, the city also uses incineration for disposal. In recent years, this practice has been less than successful, as the new 800 TPD municipal incinerator has been plagued with a number of expensive mechanical problems. Consequently, the installation has experienced a considerable amount of down time and was, in fact, being repaired at the time of the site visit. The two most significant problems are related to material degradation in the breaching area. The initial design had a stack section which reheated the combustion products after water scrubbing to take advantage of buoyant forces developed by the stack. The heat transfer system was located at the exit port of the secondary combustion chamber, was subject to entrained particle abrasion, and it subsequently eroded. The heat transfer system was replaced with a system designed to place more emphasis on material properties than heat transfer criteria but it, too, is showing significant material ablation/abrasion and will be repaired.

The second significant problem resulted from the design of the high energy water scrubber system. This system had a natural propensity to extract chlorine and other acid ions from the combustion products (due to the presence of chlorinated hydrocarbons such as PVC in the waste). This acidic solution then passed into the induced draft fan either as entrained vapor or a liquid suspension. The impeller of this large fan, first fabricated with 316 S.S., and then with high carbon steel, failed at 1800 rpm and operations

were abruptly terminated early in December of 1972. The new impellers will be made of an unspecified Hastelloy alloy which may or may not be successful. The repairs to the facility are planned to be completed in the summer of 1973 and, at that time, the incinerator will again be operational.

This new municipal incinerator has been a significant problem and has received considerable public attention. Additionally, it has been very expensive to the city, since salaries at the incinerator are better than $500,000 per year. The facility currently employs 88 men, as described below:

| | | |
|---|---|---|
| 1 | - | Supervisor |
| 3 | - | Foremen |
| 5 | - | Repair |
| 1 | - | Weighmaster |
| 6 | - | Crane Loaders |
| 8 | - | Truck Drivers |
| 9 | - | Furnace Operators |
| 55 | - | Incinerator Helpers |
| 88 | | |

These personnel are being retained during the shutdown for the purpose of facility repair and maintenance.

A relatively recent development in Houston's interest in incineration is the consideration given to the concept of establishing mini-incinerator installations at strategic locations within the city. Each of these machines is estimated to have a capacity of one to two tons per hour and as many as needed would be installed at each site. These devices are said to be relatively emissionless and will not require high energy gas cleaning equipment if operated properly. Pilot tests of these machines have been performed with mixed results; modifications have been made and the city is proceeding with the project.

The locations of the current and proposed disposal sites are indicated in Figure 4. Other installations relating to the solid waste management system, such as equipment storage and maintenance areas, are also displayed.

There have been a number of problems within the past several years regarding the disposal of Houston's solid waste. From Table 7, it is noted that the two landfill sites that began operation in 1970 were closed in relatively

● - Disposal sites

◆ - Truck lot and/or maintenance

▲ - Proposed mini-incinerator locations

FIGURE 4 : FACILITY LOCATIONS IN HOUSTON

short periods. The Almeda site was opened on the 29th of June in 1970 and was closed within eight weeks, on the 21st of August. This site was located in a white neighborhood, where residents were forceful enough to terminate operations. The Kirkpatricks site was located in a black neighborhood, where residents were also not pleased with the arrangement. This site was also shut down.

The basic local siting problem is complicated by the recent enactment of a Texas state law which prohibits the disposal of solid waste in adjacent counties without the permission of the affected county. Consequently, disposal site procurement by either the public or the private sector may be limited to the area within Harris County boundaries.

## 5.6: Equipment Description

The Department of Solid Waste Management in the City of Houston operates a fairly uniform fleet in terms of design. At this time, the mixed refuse crews utilize almost exclusively 20-yard, rear-loading packers of various chassis and body types. There are a number of older 18-yard packers, held in reserve as spares. Also, in 1972, the city took delivery of ten "grinder" type vehicles but, due to a series of cab and chassis problems, an evaluation of effectiveness has yet to be made. Bulky item crews use open bed trucks with a stated capacity of 20 yards. The vehicles for ash and dead animal collection are modified pick-up trucks.

At this time, the city has two additional types of equipment on order. It has apparently been determined that the 20-yard packers are not well suited for some alley collection; consequently, six 10-yard rear loaders have been purchased. Because of the narrower and lower construction of these vehicles, crews will be able to drive through difficult alleys to collect from stops where now only carry-out service can be performed. Also, two "Rotoboom" bulky item cranes have been purchased to expedite the collection of massive discards.

The current fleet data, excluding the modified pick-up trucks, are presented in Table 8. The 1967 trucks are 18-yard vehicles and are held in

TABLE 8: COLLECTION FLEET DESCRIPTIONS AND OPERATING COSTS [1/]

| | | | | Average Annual Costs Per Vehicle in 1972 | | |
|---|---|---|---|---|---|---|
| No. of Trucks | Model | Truck | Body | Fuel | Parts | Total |
| 23 | 1967 | International | Pak-Mor | $232.37 | $1,631.59 | $1,863.96 |
| 20 | 1968 | " | Gar-Wood | 620.32 | 2,952.84 | 3,573.16 |
| 40 | 1969 | " | Heil | 736.47 | 4,792.87 | 5,529.34 |
| 59 | 1970 | " | Pak-Mor | 796.24 | 2,908.97 | 3,705.22 |
| 30 | 1971 | " | Heil | 794.57 | 1,706.97 | 2,501.54 |
| 20 | 1972 | Ford | Heil | 489.99 | 423.61 | 913.21 |
| 10 | 1972 | International | Kuka [2/] | 212.10 | 260.83 | 472.21 |
| 202 | | | | | | |
| 13 | 1969 | International | Open-Bed | 323.36 | 463.41 | 786.77 |
| 15 | 1971 | " | Open-Bed | 429.39 | 294.14 | 723.58 |
| 28 | | | | | | |

[1/] Operating costs include neither amortization charges nor repair labor costs.
[2/] The low costs for these vehicles indicate that they were not operated for a full year in 1972.

reserve. A number of the newer 20-yard trucks are also used for this purpose. It was stated by personnel in the Department of Solid Waste Management that only ten of the better than forty reserve vehicles are operational.

5.6.1: Financing and Cost

Both additional and replacement equipment are financed through the General Fund. Vehicles of either class must be formally budgeted by the department head and approved by the Mayor and the City Council. If approval is secured, the city advertises for bids, selects the lowest responsible bid, and purchases the equipment. This process currently takes one and one-half to two years. Purchased equipment is now assigned to the Department of Solid Waste Management and reasonably accurate records are kept on each vehicle.

Table 8 presents the average annual fuel and parts costs for vehicles by year and type. The labor element of the repair costs is not kept at this time because the Motor Repair Division of the Department of Public Works feels that this is a fixed overhead liability and is, therefore, not worth keeping. However, it has been estimated that labor costs are about 35 percent of the

costs of fuel plus parts. It is clear that as vehicles age, the costs of repair rise rapidly. Examination of the fuel costs for the rear loaders purchased in 1969, 1970, and 1971 indicates that all vehicles of these classes are utilized at about the same rate, yet the parts costs for the 1969 vehicles are almost three times those for the 1971 models. The lower gas and parts costs for the 1967 and 1968 vehicles indicate that this fraction of the fleet is normally held in reserve.

The open-bed bulky item trucks are clearly less expensive to operate than the packer fleet. This finding is a natural consequence of the actual collection function, which is not as severe for bulky pickup as it is for mixed refuse. The packer vehicles are also far more complex than the open-bed trucks, which also contributes significantly to operating costs in terms of parts and labor expenses.

### 5.6.2: Vehicle Maintenance Policies

All vehicles operated by the Department of Solid Waste Management are maintained by the Motor Repair Division of the Department of Public Works. This arrangement has not been satisfactory to the Department of Solid Waste Management and there are mounting pressures to shift all sanitation vehicle repair and maintenance responsibilities to the department. The collectors are strongly in favor of such a shift, a statement which is strongly supported by "requests" 2, 3, and 4 of the petition submitted to Mayor Welch in early spring of 1972. The department director is currently exploring methods to implement this shift.

The equipment maintenance issue is not new. The workers complain that vehicles are improperly maintained, whereas the Motor Repair Division management feels that the equipment is abused. Both points of view have some validity, as indicated by the simultaneous policies of the Director of the Department of Solid Waste Management to shift maintenance responsibilities to his department and, at the same time, suspend drivers for equipment abuse.

Preventive maintenance is now performed on an informal and limited basis. Collection crews are requested to check the oil and inspect vehicles

for potential problems before starting out each day. However, this may not always be done. The Motor Repair Division is required to perform vehicle lubrication at thirty-day intervals and to wash and steam-clean the trucks when necessary. All repairs are performed when required, i.e., when the vehicles fail.

If and when the maintenance and repair responsibilities are transferred to the Department of Solid Waste Management, it is likely that more formal maintenance procedures will be established. On such a basis, true equipment costs can be determined and, additionally, vehicle problems can be identified and solved with minimum delay. Equipment damage may also drop under this arrangement because crews would have a greater responsibility for primary maintenance and a higher liability for neglect.

### 5.6.3: Equipment Replacement Policies

The replacement schedule is now set at six years, with all vehicles of this age being auctioned off. Before sale, however, each vehicle is stripped for any parts that can be salvaged for installation in a newer truck. The resulting hulks still manage to sell for between $600 and $900, and it is suspected that small private sector operators are the purchasers.

## 5.7: Financial Aspects of the Houston Solid Waste System

The municipal solid waste system of Houston, Texas relies on the General Fund as a revenue source for its operating budget. The Department of Solid Waste Management collects a user charge for the collection of the schools in the city, and this money is contributed to the General Fund. However, this money is not directly earmarked for the Department of Solid Waste Management, as all disbursements are made from the General Fund without recognition of the source of income. Major capital expenditures are generally financed through bond issues and through a special equipment fund administered by the City Treasurer.

Presently, the capital and operating budgets of the department are not developed simultaneously. The Department of Solid Waste Management was

recently formed from the Refuse Division of the Department of Public Works, so that the last capital budget was actually formulated in the Department of Public Works. The new Department of Solid Waste Management will assume this duty in the future.

The budgetary process for the operating budget begins with the Director of the Department of Solid Waste Management and his staff. He develops the budget based upon historical costs, changes in the number of men, and future increases in existing wages. This budget is usually developed with no guidance from the Budget Office. The fully constructed budget is next passed along to the City Treasurer for review. After his approval is secured, the operating budget is passed to the Mayor for approval. The Mayor may either cut or add to the budget, or approve it as presented. Finally, the Mayor combines the Department of Solid Waste Management budget with the other departmental budgets and presents an operating budget for the city, along with the departmental budgets, to the City Council for approval. Houston's fiscal year begins on the first of January, but the budget is usually not approved until very late in spring despite City Charter requirements to the contrary. Most incremental expenditures and capital funds are usually cut off in November, thus the department has only a four-month period (July - October) in which to add new personnel or make minor capital expenditures.

5.7.1: Sources of Revenue

The General Fund serves as the basic revenue source for the budget of the Department of Solid Waste Management. The wide variety of taxes, fees, and charges which contribute to this fund are shown in Table 9.

General Fund

The primary revenue source for the General Fund is a property tax. The assessed valuation of city property and the property tax rates for the past ten years are shown in Table 10. The relatively rapid growth and prosperity of the Houston economy has allowed the city to reduce the tax rate over these years. The assessed value of the city's property has increased by 116 percent during this interval while the tax rate decreased by 25 percent.

## TABLE 9

## 1972 SUMMARY OF GENERAL FUND ESTIMATE

| | | | |
|---|---|---|---|
| **Cash as of 1/1/72** | | | 14,149,050 |
| **Transfers & Grants** | | | |
| Federal Funds (Health) | | 2,814,328 | |
| E. E. A. Funds | | 272,796 | |
| Bond Funds | | 2,326,506 | |
| Airport Funds | | 178,134 | |
| Civic Center Funds | | 259,788 | |
| Other Transfers (County and Water) | | 399,191 | 6,250,743 |
| **Estimated Revenue for 1972** | | | |
| Current Taxes | | 74,146,196 | |
| Delinquent Taxes | | 4,337,497 | |
| Franchise Taxes | | 11,300,000 | |
| Investment Income | | 4,767,359 | |
| Court Fines | | 5,734,008 | |
| Sewer Service Charges | | 4,634,688 | |
| Sales Tax | | 34,000,000 | |
| Mixed Drink Tax | | 500,000 | |
| Airport Service Charges | | 1,526,000 | |
| Miscellaneous Revenue | | 8,686,050 | |
| Industrial Contracts | | 1,829,715 | 151,461,513 |
| **Total Available for Appropriation:** | | | 171,861,306 |
| **Less: Debt Service & Fixed Charges** | | | |
| Bond Maturities and Interest | | 35,668,510 | |
| **Fixed Charges** | | | |
| Interest on Cash Requirements | 400,000 | | |
| Commission and Exchange | 40,000 | | |
| Miscellaneous Refunds | 200,000 | | |
| Notes Payable | 125,000 | | |
| Interest on Notes Payable | 15,000 | | |
| Interest on Equipment Purchases | 200,000 | | |
| NW Houston Supply Contract | 290,117 | | |
| Gulf Coast Waste Contract | 405,522 | 1,675,639 | 37,344,149 |
| **Amount Available for Departmental Operations** | | | 134,517,157 |

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TABLE 10

PROPERTY VALUATION, TAX RATES, AND THE AMOUNT OF PROPERTY TAXES COLLECTED - 1962-72

| Year | Amount of Property Valuation[1] | Tax Rate | Levy | Amount Collected | Percent of the Levy Collected |
|---|---|---|---|---|---|
| 1962 | 2,541,681,370 | 2.00 | 50,833,627 | 48,176,647 | 94.77 |
| 1963 | 2,601,036,240 | 2.00 | 52,020,724 | 50,075,158 | 96.25 |
| 1964 | 2,735,143,590 | 2.00 | 54,702,872 | 52,597,514 | 96.15 |
| 1965 | 2,874,652,040 | 2.00 | 57,493,040 | 55,665,901 | 96.82 |
| 1966 | 3,143,725,100 | 2.00 | 62,874,514 | 60,097,014 | 95.58 |
| 1967 | 3,335,969,750 | 2.00 | 66,719,395 | 63,509,154 | 95.18 |
| 1968 | 3,383,127,690 | 2.00 | 67,662,553 | 66,052,689 | 97.62 |
| 1969 | 3,589,550,420 | 1.80 | 64,611,908 | 63,933,052 | 98.95 |
| 1970 | 3,868,611,730 | 1.80 | 69,635,011 | 67,919,980 | 97.54 |
| 1971 | 5,484,690,600 | 1.50 | 82,270,359 | 79,800,408 | 97.00 |
| 1972[2] | 5,484,690,600 | 1.50 | 82,270,359 | 79,800,408 | 97.00 |

[1] Based upon 53 percent of actual value

[2] Estimated figures for 1972

The other major revenue source contributing to the General Fund is sales tax revenue. The one-percent city sales tax will contribute approximately 34 million dollars in 1973. This represents approximately 22.5 percent of the total revenue entering the General Fund.

The user charges collected from the Houston School District are included in the figure for industrial contracts. The current charge for the 31 school districts is 95 dollars per day and the solid waste is collected on the basis of a five-day workweek. Assuming that the school year in the district lasts 36 weeks, the total annual revenue generated by the operation is approximately $17,100.

Bonds

For major capital expenditures, the Department of Solid Waste Management relies upon bonds as a method of financing. These issues are usually general obligation bonds. One of the bond projects in the $145 million dollar

Capital Improvements Program voted on February 24, 1973, was for the Department of Solid Waste Management. The particular project is the Southeast Maintenance Facility. Funds from this bond will be used for the construction of an office and vehicle maintenance facility for the Department of Solid Waste Management in the southeast section of the city. Trucks currently serving the southeast must travel from service centers located on the Eastex Freeway or from Beechnut in the southwest, resulting in excessive driving distance. Other previous bond issues are discussed in the expenditure section.

Equipment Fund

The Equipment Fund is financed out of the General Fund and administered by the City Treasurer. When the Department of Solid Waste Management needs new vehicles, it requests funds from this account. It is interesting to note that new vehicles purchased through this fund are financed over a period of three years.

Subsidies/Grants

In 1972, the Department of Solid Waste Management obtained federal funds through the Emergency Employment Act. These revenues, which amounted to $25,000 per month, were used to hire 45 additional employees, including 15 new drivers and 30 new laborers. These new positions were requested as part of regular operating expenses for the 1973 fiscal year, and presumably with the approval of the 1973 budget, these federal funds will no longer be required.

5.7.2: Expenditures

The expenditures of the Department of Solid Waste Management are monitored by means of a regular monthly accounting report from the controller's office. This monthly statement reports appropriations, expenditures and unexpended balances for the department. These data are not disaggregated into divisions such as administrative, collection, and disposal, and are reported for the entire department's operations. The expense items which are reported in the statement are shown in Table 11 along with the annual department expenses for the past five years.

TABLE 11

SUMMARY OF OPERATING EXPENDITURES FOR

SOLID WASTE COLLECTION AND DISPOSAL

| Expenditure Categories \ Fiscal Years | 1968 | 1969 | 1970 | 1971 | 1972 |
|---|---|---|---|---|---|
| PERSONAL SERVICES | | | | | |
| Salaries | $3,850,138 | $4,115,198 | $4,917,128 | $5,408,633 | $5,718,203 |
| Overtime | 104,281 | 117,566 | 40,755 | 56,937 | 73,975 |
| Total: | $3,954,419 | $4,232,764 | $4,957,883 | $5,465,570 | $5,792,178 |
| SUPPLIES | | | | | |
| Office | 1,930 | 1,635 | 4,637 | 2,794 | 1,563 |
| Cleaning & Sanitary | 266 | 2,736 | 2,968 | 2,501 | 2,320 |
| Drugs & Chemicals | 7,521 | 1,768 | 1,850 | 8,910 | 10,526 |
| Miscellaneous | 3,970 | 2,428 | 4,685 | 3,786 | 3,634 |
| Total: | $ 13,687 | $ 8,567 | $ 14,140 | $ 17,991 | $ 18,043 |
| CONTRACTUAL | | | | | |
| Transportation | 600 | 600 | 609 | 602 | 600 |
| Communication | 11,799 | 10,186 | 11,261 | 10,601 | 10,675 |
| Heat-Light-Power | 49,783 | 39,054 | 19,031 | 54,533 | 50,195 |
| Travel | 1,150 | 220 | 92 | 110 | 726 |
| Sponsorship | 152,829 | 176,997 | 266,380 | 318,192 | 306,885 |
| Sanitary Fill Fees | 44,010 | 255,102 | 1,403,410 | 1,405,565 | 660,288 |
| Resource Recovery | 369,950 | 390,765 | 135,685 | -0- | 569,334 |
| Miscellaneous | 28,627 | 21,341 | 31,263 | 25,365 | 128,745 |
| Total: | $ 658,748 | $ 894,265 | $1,867,731 | $1,814,968 | $1,727,448 |
| MAINTENANCE | | | | | |
| Land & Building | 4,645 | 5,911 | 5,099 | 3,861 | 5,662 |
| Furn. & Fixtures | 455 | 234 | 154 | 160 | 424 |
| Mach. & Tools | 8,248 | 12,174 | 4,867 | 13,642 | 18,433 |
| Automotive | 454,194 | 599,817 | 651,574 | 710,156 | 829,468 |
| Garbage Dumps | 6,600 | 10,553 | 4,397 | 1,137 | 3,134 |
| Incinerators | 29,992 | 20,889 | 8,878 | 65,473 | 38,380 |
| Total: | $ 504,134 | $ 649,578 | $ 674,969 | $ 794,429 | $ 895,501 |
| CAPITAL OUTLAY | 4,801 | 5,266 | 4,501 | 3,032 | 12,085 |
| GRAND TOTAL: | $5,135,789 | $5,790,440 | $7,519,224 | $8,095,990 | $8,445,255 |

The total cost for the collection and disposal of solid waste has grown by approximately $3.3 million over the past five years. This represents an increase of 64.4 percent. Unlike many systems, the rising expenses have not been manifested by labor costs alone, as total salary expenses have grown only 47.2 percent. The rising costs have also been due to increased contractual costs and, to a lesser degree, maintenance costs. The total contractual expenses of the department increased by over one million dollars between 1968 and 1972. This growth is primarily due to the rise of three accounts: Sponsorship - $154,056; Fill Fees - $612,278; Resource Recovery $199,384. It is interesting to note the changing patterns of the disposal expense between fill fees and resource recovery as the city strives to obtain an optimum disposal technique. A more detailed listing of the monthly sponsorship costs incurred by the department are shown in Table 12. The rise in maintenance expenses of $391,367 is primarily due to growing automotive repair costs, which have increased by 82.6 percent during the designated period. Largely because of the greater relative increase of contractual costs and maintenance costs, labor expense as a percentage of total expense has fallen from 77 percent in 1968 to 68.6 percent in 1972.

The capital expenditures shown in Table 11 are for the acquisition of office furniture and equipment. Large capital expenditures, other than for new vehicles, are always financed through bond issues. Table 13 presents the various projects for which bonds were issued in the last five years. In fact, some of these issues are more than five years old, but the data prevented a full disclosure of the year they were floated and their original amount.

The new equipment requested by the Department of Solid Waste Management is shown in Table 14. The new rear loaders are replacement vehicles for 1967 and 1968 models.

## TABLE 12

## MONTHLY SPONSORSHIP PAYMENTS

| Sponsorships | | Sponsorships (Cont.) | |
|---|---|---|---|
| Afton Oaks | 746.58 | Memorial Plaza | 307.74 |
| Ashford Community Assn., Inc. | 1,275.12 | Memorial Trails | 67.62 |
| Ashford Forest Maintenance Fund | 190.44 | Memorial Way | 93.84 |
| Ashford West Community Assn. | 478.86 | Nottingham Forest | 859.74 |
| Autumn Oaks Civic Club | 110.40 | Nottingham IV Maintenance Assn. | 212.52 |
| Avalon | 430.56 | Nottingham Maintenance Fund | 441.60 |
| Braeburn Valley | 114.54 | Nottingham West | 462.30 |
| Braeburn Valley Home Owners Assn. | 735.54 | Pine Shadows | 169.74 |
| Briarbend | 180.78 | Pinewood | 96.80 |
| Briarcroft | 396.06 | Piney Point | 46.92 |
| Briardale | 27.60 | River Forest Civic Assn. | 66.24 |
| Briargrove | 1,239.24 | River Oaks | 2,183.16 |
| Briargrove Park | 1,335.84 | Royden Oaks | 284.28 |
| Briarmeadow | 887.34 | Rustling Oaks | 173.88 |
| Bunker Hill Woods | 38.64 | Rustling Pines | 173.88 |
| Charnwood | 109.02 | Sandalwood | 241.50 |
| Del Monte II | 70.38 | Sherwood Forest | 149.04 |
| Garden Oaks | 974.28 | Sleepy Hollow Woods | 20.70 |
| Gaywood | 164.22 | Tanglewood | 1,479.36 |
| Huntleigh | 89.70 | Tealwood Homeowners Assn. | 110.40 |
| Indian Trail Maintenance Fund | 51.06 | Thornwood Fund, Inc. | 505.08 |
| Lakeview Civic Club | 125.58 | Walnut Bend | 1,264.08 |
| Linkwood Civic Club | 197.34 | West Oaks #1 | 24.84 |
| Longwoods Homes Association | 60.72 | West Oaks #2 | 30.36 |
| Mamre Civic Club, Inc. | 77.28 | West Oaks #3 | 22.08 |
| Maplewood West | 338.10 | Westchester Owners Committee, Inc. | 506.56 |
| Memorial Bend | 499.56 | Whispering Oaks | 201.48 |
| Memorial Forest | 459.54 | Wilchester | 830.76 |
| Woodland Hollow | 48.30 | Wilchester West, 1 & 2 | 710.70 |
| Yorkshire | 212.52 | Willow Bend | 1,021.20 |
| Lake Houston | 1,223.25 | Willow Meadows | 1,120.56 |
| | 12,883.37 | | 26,762.13 |

## TABLE 13

## GARBAGE DISPOSAL BOND FUND

- Engineering incidental to constructing an Incinerator on Homes Road
- Purchase of land for Reed Road Sanitary Fill Site
- Constructing two 400-ton per day incinerators on Holmes Road
- Purchase of fly ash removal equipment for Incinerator on Reed Road
- Purchase of induced draft fans for garbage Incinerator on Holmes Road
- Purchase of land for Kelley Street Incinerator Site
- Engineering incidental to Utility Lines to Incinerators and Compost Plant Sites
- Mechanical and electrical construction at Holmes Road Incinerator
- Constructing the Garbage Division Headquarters Building at Northeast Service Center
- Engineering incidental to constructing a refuse incinerator
- Two refuse cranes for new incinerator
- Bond and Legal Expenses
- Modification of air-pollution system at Holmes Road Incinerator
- Draft Fans for Holmes Road Incinerator
- Engineering incidental to disposal of solid wastes
- Modification to Holmes Road Incinerator
- Soil investigation incidental to sanitary fill near Sheldon
- Engineering incidental to sanitary fill sites
- Purchase of sanitary fill site on Homestead Road
- Purchase of land for Holmes Road sanitary fill site
- Purchase of land for Transfer Station A on S. W. Freeway between Westpark and Ullrich
- Soil investigation to Tidwell Road sanitary fill site
- Purchase of buildings for use as equipment storage for refuse department
- Rental of office space for Land Acquisition Department
- Modification of inlet ducts and draft outlets at Holmes Road Incinerator
- Engineering service in connection with Holmes Road Incinerator
- Architectural fee incidental to remodeling of Beechnut Compost Plant
- Neighborhood incinerators at city-furnished sites under contract to Houston Natural Gas Corporation

# TABLE 14

## CITY OF HOUSTON
## NEW EQUIPMENT REQUEST

Date 1-3-73 Page 6

Department Solid Waste Management Division

| No. of Units | Type Vehicle Requested - Describe Fully | Cost Per Unit | Total Cost | One unit must be turned in for each new unit. List shop number, year and make, mileage and to whom assigned. |
|---|---|---|---|---|
| 8 | Automobiles - Fordors | 2,500 | 20,000 | 951 1968 Plymouth 94,000<br>1013 " " 72,000<br>1025 " " 105,000<br>1027 " " 75,000<br>1037 " " 58,000<br>1040 " " 98,000<br>1069 " " 68,000<br>1394 1969 Ford 70,000 |
| 4 | 1/2 Ton Pickups Long Wheelbase | 2,100 | 8,400 | 301 1967 Dodge<br>306 " "<br>378 1968 Ford<br>1119 " " |
| 2 | 12 Cu. Yd. Tandem Axle Dump Trucks | 10,000 | 20,000 | New Equipment to be used for hauling ashes at Mini-Incinerators. |
| 1 | Tractor with 60" Rotary Mower Attachment | 3,000 | 3,000 | New Equipment to cut grass at all locations. |
| 40 | 20 Cu. Yd. Rear Loading Packer Garbage Trucks | 14,000 | 560,000 | To Replace 23, 1967 Models and 17, 1968 Models. |
| 12 | 6 Cu. Yd. Containers | 350 | 4,200 | To be used with Lo-Dal Front Loading Garbage Trucks. |

# APPENDICES

# APPENDIX A

# ENABLING ORDINANCE

#71-1420

**MAYOR'S OFFICE**

**HOUSTON, TEXAS**

August 10, 19 71

**Honorable City Council of the City of Houston**
**City Hall**

**Gentlemen:**

**In accordance with the provisions of the Charter of the City of Houston, I submit to you the following ordinance with the request that it be passed finally on the date of its introduction. There exists a public emergency requiring such action and I accordingly request that you pass the same if it meets with your approval.**

**Yours very truly,**

Mayor Welch, Councilmen McKaskle, Miller, Ford, Mancuso, Mann & Goyen voting aye - Nays none Councilmen McLemore & Gottlieb out of the City

CAPTION

ADOPTED

**Mayor of the City of Houston.**

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AN ORDINANCE CREATING A NEW DEPARTMENT WITHIN THE CITY OF HOUSTON TO BE DESIGNATED THE DEPARTMENT OF SOLID WASTE MANAGEMENT OF THE CITY OF HOUSTON; PROVIDING FOR A DIRECTOR TO BE THE HEAD OF SUCH DEPARTMENT; PRESCRIBING THE DUTIES AND FUNCTIONS OF SUCH DEPARTMENT; PROVIDING AUTHORITY FOR CERTAIN ADMINISTRATIVE PROCEDURES; AND DECLARING AN EMERGENCY.

* * * * * *

BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF HOUSTON:

Section 1. There is hereby created a department of the City of Houston to be designated the Department of Solid Waste Management of the City of Houston.

Section 2. The head of the Department of Solid Waste Management of the City of Houston shall be the Director of such department who shall be appointed by the Mayor and confirmed by the City Council.

Section 3. The Department of Solid Waste Management of the City of Houston and such employees as are assigned to such department shall be charged with the following duties:

(a) to supervise and be responsible for the collection, transportation and disposal of solid waste.

(b) to carry out the policies of the Mayor and City Council in the overall planning effort to develop a reliable and efficient method for solid waste disposal.

(c) such other duties and responsibilities as may be assigned by the Mayor and City Council of the City of Houston.

Section 4. The Mayor, the City Controller, the City Treasurer, the heads of City departments and all other concerned officers and employees are hereby authorized to initiate and carry out the necessary administrative procedures to effect the establishment of such department of Solid Waste Management.

Section 5. There exists a public emergency requiring that this ordinance be passed finally on the date of its introduction, and the Mayor having in writing declared the existence of such emergency and requested such passage, this ordinance shall be passed finally on the date of its introduction, this the 4th day of August, 1971, and shall take effect immediately upon its passage and approval by the Mayor.

PASSED this 4th day of August, A. D. 1971.

APPROVED this 4th day of August, A. D. 1971.

Louie W Welch
Mayor of the City of Houston

APPROVED:

Alan J. Levin
Assistant City Attorney

# APPENDIX B

# PETITION AND RESPONSE

## PETITION TO MAYOR WELCH

TO: Mayor Welch and the City Council

We, the undersigned employees of the Refuse Division would like to petition you on the following proposals;

1. We would like for you to hire a director or appoint an acting director for the new department named Solid Waste Disposal and to activate this newly formed department.

2. We would like for you to put the repair shops serving this division under the department and promote someone in the department to Supervisor over the shops.

3. We would like equipment to clean and maintain the vehicles of the department.

4. We would like an adequate number of men to service the equipment properly.

5. We would like an adjustment in the Foremen per day rate of pay.

6. We would like a new set of ordinances to work by without exceptions.

7. We would like personnel to operate the heavy trash trucks which are badly needed to be in service.

8. We would like for all heavy trash trucks to be reorganized under the new department with two additional Foreman over all heavy trash trucks instead of being divided among approximately fifteen supervisors.

9. We would like a provision made so men disabled while working in this department be transferred to a division where they could earn their living and keep their benefits.

10. We would like for you to put all employees in this new department on a five day week to stop descension and work slow down among six day employees.

11. We are not presenting an ultimatum or demanding these proposals. We are only asking they be given immediate attention and consideration as we are in desperate need of changes and revisions within the division. It would be foolish to start any changes or make plans, now, as they may conflict with the plans of the new Director.

## REPLY FROM MAYOR WELCH

Concerning the petition you recently sent me, I shall reply to your proposals in the order listed therein:

1. We are very close to hiring a Director and the appointment will be made within the next few weeks.

2. An architect has been commissioned to convert the Beechnut Compost plant into a garage and maintenance center. Garbage trucks will be housed and maintained at this location. The garage will still be under the Public Works Department, however, mechanics will be assigned to maintaining the Garbage trucks in a section to be set aside for this purpose only.

3. A steam cleaning unit will be installed at the Beechnut location. If this unit proves satisfactory, others will be installed.

4. We have money in this year's budget for additional men. More will be added when the Beechnut location is completed.

5. This has been done.

6. This has been requested and is being studied.

7. Instructions have been issued to employ such personnel.

8. This will be considered by the new department head.

9. If we are given the names and requests for such transfers, each case will be considered.

10. City Council has approved time and one half pay for all employees who work over 40 hours.

# APPENDIX C

# SOLID WASTE ORDINANCE

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## Chapter 20

## GARBAGE AND TRASH*

Art. I. In General, §§ 20-1—20-24
Art. II. Private Haulers, §§ 20-25—20-41
Div. 1. Generally, §§ 20-25—20-33
Div. 2. Vehicle License, §§ 20-34—20-41

## Article I. In General

**Sec. 20-1. Definitions.**

As used in this chapter, unless the context clearly requires otherwise:

*Director* means the director of the department of public works and engineering of the city.

*Division* means the refuse division of the department of public works and engineering.

*Garbage* means all animal or vegetable matter, such as waste material and refuse from kitchens, residences, grocery stores, butcher shops, restaurants, hotels, rooming and boarding houses, and other deleterious substances and any other matter commonly understood to be garbage.

*Trash* means rubbish, such as feathers, coffee grounds, ashes, tin cans, paper, boxes, glass, grass, shrubs, yard cleanings, grass clippings, leaves and tree trimmings, and any other matter commonly understood to be trash.

*Vehicle* means every device in or by which any person or property is or may be transported or drawn upon a public highway. (Code 1958, § 17-1)

**Sec. 20-2. To be placed in containers; container specifications.**

(a) Except as provided in subsection (c), garbage and trash shall be placed in containers of not more than thirty

*Charter reference—Regulation and disposal of garbage, Art. II, § 7.
Cross references—Deposit of garbage or waste at airport prohibited, § 9-32; accumulations of flammable or combustible waste or rubbish, § 18-10; burning rubbish and trash, § 18-14 et seq.; dumping or accumulating garbage and trash so as to afford food or harborage for rats prohibited, § 21-84; disposal of garbage and refuse at trailer parks, § 47-24.

(30) gallons capacity. The combined weight of the garbage and trash and container shall not exceed one hundred (100) pounds.

(b) Except as provided in subsection (c), the container shall be a watertight receptacle of a solid and durable grade of metal and shall be provided with suitable handle or handles on the outside. It shall have a tightly fitting metal cover equipped with a handle, or a canvas cover made of not less than nine (9) ounce canvas, properly water-proofed and mildew-proofed, and constructed with a rubber band encased in a loop of the cover so as to hold the cover tightly against the top of the container to prevent cockroaches, flies, and other vermin from entering or leaving the container. The canvas cover must have suitable fasteners or snaps for attaching to the handle of the container so that the top can be removed for emptying the container, but so that it remains attached to the handle and cannot be misplaced or blown away. The fasteners or snaps shall be of such design that the cover can readily be detached from the handle for washing and cleaning.

(c) Disposable bags or containers made of plastic film or of any other synthetic or natural organic material which has sufficient strength and quality to securely contain a capacity of not less than twenty (20) nor more than thirty-five (35) gallons of household refuse or garbage may be used in lieu of the containers required by subsections (a) and (b); provided that, no such container shall be sold, used, or placed at the curb for collection without prior approval of the specific type of container by the manager of the refuse division. The approval of any such bag or container may be revoked by the manager of the refuse division at any time, provided a finding has been made that the bag or container is of inferior quality to the extent that it will not comply with the requirements of this subsection. (Code 1958, § 17-3; Ord. No. 67-1015, § 1, 5-31-67)

**Cross references**—Garbage and trash receptacles at convalescent homes, § 14-23; garbage and refuse receptacles at piers and in public areas at Lake Houston, § 24-31.

**Sec. 20-3. Condemnation of defective containers.**

Garbage and trash containers that have deteriorated to the extent of having jagged or sharp edges capable of causing injury to the garbage collectors or others whose duty it is to handle the containers, or to such an extent that the lids will not fit tightly or securely, will be condemned by the city, acting through the manager of the refuse division. (Code 1958, § 17-3)

**Sec. 20-4. Overloading containers.**

The contents of any garbage or trash container which is so overloaded that the lid will not fit securely on the container will not be picked up by the garbage collectors. The contents of any garbage or trash container which, with the container, weigh more than one hundred (100) pounds will not be picked up by the garbage collectors. (Code 1958, § 17-4)

**Sec. 20-5. Placement of containers for collection.**

Any person desiring to place garbage or trash for collection shall place the container on or near the curb line in front of his residence or in a paved alleyway adjacent to such residence not later than eight o'clock a.m. on those days designated by the proper authorities of the city for the collection of garbage. After the garbage and trash has been collected by the collector, the owners of the containers shall remove the same immediately from the space between the sidewalk and curb line or from the alleyway not later than eight o'clock p.m. of the day that such garbage has been collected, and no person shall leave any garbage or trash container empty or otherwise in the space between the sidewalk and curb line, or in an alleyway, between the hours of eight o'clock p.m. and six o'clock a.m.

It shall be unlawful for any person to place any disposable container provided for in section 20-2(c) at the curb for collection without having securely bound or stapled the open end of the container in such a manner as to render the contents thereof inaccessible to flies, rodents, insects and dogs. (Code 1958, § 17-5; Ord. No. 67-1015, § 1, 5-31-67)

**Sec. 20-6. Molesting or disturbing containers.**

It shall be unlawful for any person to molest, remove, handle or otherwise disturb garbage or trash containers or contents which have been placed on city property for servicing by the garbage collectors; provided, that this section does not apply to the owner, occupant, lessee or tenant of the residence or dwelling so placing the container and contents. (Code 1958, § 17-6)

**Sec. 20-7. Preparation of tree trimmings and hedge cuttings for collection.**

Any person desiring to place tree trimmings or hedge cuttings for collection shall cause the same to be securely tied in bundles not heavier than seventy-five (75) pounds nor more than five (5) feet in length and eighteen (18) inches in diameter. He shall not place more than two (2) bundles for removal on any one day of collection and shall place the same for collection in the manner and at the times provided for the collection of garbage. (Ord. No. 61-2036, § 1, 11-8-61)

**Sec. 20-8. Collection from business establishments in residential areas.**

On any one collection day, the garbage collectors will pick up the contents of not to exceed three (3) garbage and trash containers complying with this article from filling stations, grocery stores, restaurants, laundries or other business establishments in residential areas under the same conditions and provisions prescribed for a residence or dwelling. (Code 1958, § 17-8)

**Sec. 20-9. Removal of rubbish from business premises.**

Rubbish shall be removed from all business premises every day, and as often as deemed necessary by the health officer. (Code 1958, § 17-11)

**Sec. 20-10. Collection of dead animals.**

(a) Dead animals not in excess of one hundred (100) pounds will be picked up by the garbage collectors on regularly designated days of collection, but in no event shall the person having such dead animal allow it to remain undisposed of for a period longer than twelve (12) hours. In the event a dead animal must be disposed of on a day other than the regularly designated collection day, the refuse division shall be notified at the city hall between the hours of eight o'clock a.m. and four o'clock p.m. Dead animals shall not be placed in garbage containers.

(b) Dead animals in excess of one hundred (100) pounds will be removed by the refuse division at the owner's expense, upon the payment of a fee of fifteen dollars ($15.00), which fee shall be in addition to any other garbage collection fee. The city will not pick up dead animals from places making a business of treating, handling or disposing of animals. (Code 1958, § 17-9)

**Sec. 20-11. Placement for collection of debris other than garbage and trash.**

Any person desiring to dispose of any waste debris or other substance not coming within the definition of garbage or trash as provided in this article, and who desires to place the same between the curb line and the sidewalk for collection by private collectors, or by himself, must securely tie or wrap the same so that the contents cannot become scattered upon the streets of the city. Such waste, debris or other substance shall not be left between such sidewalk and curb line more than two (2) hours. (Code 1958, § 17-10)

**Sec. 20-12. Dumping restricted; permits for use of property as dumping grounds.**

It shall be unlawful for any person to dump, unload, discharge, or in any other manner place or cause to be placed, any raw garbage or organic matter on any lot, tract or parcel of land located within the city limits, except at garbage dumps or dumping grounds which are owned, maintained,

operated or authorized by or under contract with the city. It shall be unlawful for any owner, lessee or person in control of any real property within the corporate boundaries of the city to cause or permit the dumping, unloading, discharging or placing or causing to be placed of any raw garbage or organic matter on any such property, except that the director of public health may grant written permits allowing the use of designated premises as garbage dumps or dumping grounds where the following minimum public health and safety standards are met:

(1) The dumping, unloading, discharging or placing of refuse shall not take place within two hundred (200) yards of any man-made structure used for human habitation; provided however, that this restriction shall be applicable only to man-made structures which were in existence at the time the director of public health issued the written permit authorizing use of the particular land for a dump or dumping grounds.

(2) The dumping, unloading, discharging or placing of refuse shall not be allowed in any location when it is determined by the director of public health or his agent that by so allowing it would cause or tend to cause pollution, contamination or any other undesirable effect upon subsurface waters located in the area of the proposed dump or dumping grounds.

(3) All such garbage, trash, refuse or other waste materials shall be processed and treated in accordance with rules and standards promulgated by the state department of health. (Code 1958, § 17-12; Ord. No. 69-1136, § 1, 7-1-69)

Amendment note--Ord. No. 69-1136, § 1, amended § 20-12 by adding the provisions authorizing permits to use property as dumping grounds.

### Sec. 20-12.1. Revocation of permit to use property as dumping ground.

If, after the issuance of a written permit allowing a certain property to be used as a dump or dumping grounds, a subsequent inspection by the health department reveals that the minimum public health and safety standards are not being complied with, the director of public health shall issue notice

to the permit holder setting out the nature of the deficiency and requiring compliance within twenty-four (24) hours of the time notice is given. If compliance is not attained within the period allowed, the director of public health may revoke the permit. Upon a second finding of the same or a similar violation, the director of public health may, without notice, revoke the permit. (Ord. No. 69-1136, § 2, 7-1-69)

Editor's note—Ord. No. 69-1136, §§ 2—4 did not expressly amend this Code, hence codification as §§ 20-12.1—20-12.3 was at the discretion of the editors. The editors inserted section references to maintain Code format.

### Sec. 20-12.2. Sections 20-12 through 20-12.3 declared cumulative.

Sections 20-12 through 20-12.3 shall be cumulative of and in addition to all other provisions in Article I of this chapter and shall never be construed to have repealed any provision of said Article I by implication or to have affected any acts or proceedings undertaken by virtue of any such provision of Article I. (Ord. No. 69-1136, § 3, 7-1-69)

Note—See the editor's note following § 20-12.1.

### Sec. 20-12.3. Penalties for violations of sections 20-12 through 20-12.2.

Any violation of sections 20-12 through 20-12.2 by any person, firm or private corporation, shall upon conviction, subject the offender to a fine of not less than ten dollars ($10.00) and not more than two hundred dollars ($200.00), and each day of any such violation shall be treated as a separate offense. (Ord. No. 69-1136, § 4, 7-1-69)

Note—See the editor's note following § 20-12.1.

### Sec. 20-13. Deposit on streets, alleys or other public property.

(a) It shall be unlawful for any person to throw, dispose or place any stable manure, hulls, peelings, handbills or other deposits or litter upon sidewalks, streets or other public places in the city.

(b) No garbage, trash, paper, ashes, rubbish, old automobile parts or junk of any nature whatsoever shall be thrown or deposited in any street or alley, or upon any side-

walk, or between any curb and sidewalk, or on any other public property in the city, and the presence of any such upon any street or alley shall be held to constitute a violation of this section on the part of the owner or occupant of the property on whose half of the street or alley such commodities are permitted to lie for twenty-four (24) hours.

(c) It shall be unlawful for any person, the owner, lessee or occupant of any house, building or place fronting on a public street of the city to permit any paper or trash to be or remain in such street opposite such premises at any point between the line of such property and the center of the street. (Code 1958, §§ 17-13—17-16)

**Cross reference**—Streets generally, Ch. 41.

### Sec. 20-14. Burning of garbage prohibited; exception.

It shall be unlawful for any person to burn, or cause to be burned, or permit the burning of, within the city, in a place other than an incinerator constructed and operated in compliance with Chapter 65 of the City of Houston Building Code, any and all refuse accumulation of animal, food or vegetable matter, liquid or otherwise, that attends the preparation, use, cooking, dealing in, or storing of meat, fish, fowl, fruit, or vegetables, whether the same is from kitchens, residences, grocery stores, butcher shops, restaurants, hotels, motels, or rooming and boarding houses. (Code 1958, § 17-7; Ord. No. 59-190, § 1, 2-17-59; Ord. No. 70-722, § 1, 5-19-70)

**Amendment note**—Ord. No. 70-722, § 1, amended § 20-14 to permit burning of garbage in an incinerator constructed and operated as provided in said section.

**Cross reference**—Regulations governing burning of trash and refuse, § 18-14 et seq.



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